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A REVISION OF THE NORTH AMERICAN SPECIES OF THE DIPTEROUS GENUS HYDROPHORUS.

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The genus Hydrophorus, established by Fallén in 1823, as limited by Loew in 1857, as generally used since and as herein understood, comprises those flies of the family Dolichopodidæ which have the posterior crossvein located near the hind margin of the wing (distant about its own length, measured on the fifth vein); fourth vein ending in or behind the apex (this excludes Scellus, in which it ends before the apex); front femora thickened (this excludes Liancalus), more or less spinose beneath; dorsum of thorax not with a concave or flattened space before the scutellum (excludes Medeterus); and with the usual single row of postorbital small bristles replaced below with a loose tuft of pale hairs covering all the posterior surface of the head below the neck.

The species are rather small, from 2.5 to about 6 mm. in length. The adults are always found close to the edge of water on wet earth, or else running on the surface of the water. They are carnivorous, seizing smaller flies, etc., and holding them with their raptorial front legs while they suck out the juices. The larvæ have not been reported to my knowledge, but it is almost certain that they live in mud at the edge of water.

The adults have a wide range of season, as will be indicated by the dates cited in connection with the descriptions. Considering the fact that several species can easily be found in any locality, the genus has been little collected. This is partly due to the lack of those conspicuous male characters which render some other Dolichopodidæ so interesting, and partly to a general similarity of appearance which has made the taxonomy of the genus comparatively unattractive. However, in the following

pages it will appear that nothing but a closer study is needed (especially with the new binocular dissecting microscopes) to find characters almost if not quite as interesting as those of Dolichopus.

The North American species were so little known at the time of Loew's monograph of the family that he could describe only three species, to which he afterward added two in the later part of his Centuries. The principal contribution to the genus since that time has been by Wheeler (Proc. California Acad. Sciences, 3rd ser. Zool. Vol. II, pp. 62–69, 1899) in which a table of species is given, five new species described, and numerous excellent figures published, showing especially the spinulation of the front femur and tibia, which had been but little appreciated before.

Walker described four species in this genus, of which I think I recognize *chrysologus*, which had before been identified with his name *glaber;* the rest are mentioned at the end of this paper. Say's *Medeterus lateralis* I consider to be a Neurigona, and his *punctipennis* to be a Pelastoneurus.

Bibliographic references are given herein only where they correct or add to those of my Catalogue, now generally accessible.

A few suggestions about specific characters in the genus will doubtless be of use to those who undertake to determine specimens.

A highly interesting and heretofore unreported character is the presence in three of our species of a row of bristles across the occiput (fig. 4); as the usual pair of postvertical bristles are included in the row, I have referred to them all by that term. The black bristles which form a row behind the upper part of the eye I have termed the postorbitals; they extend much farther down in some species than in others. Beneath the neck among the pale hairs called the beard are sometimes several black bristles; they are too hard to see to be of much importance in classification, but I have mentioned their occurrence when I could see them. The width of the cheek at the lower edge of the eye is an important character, but it is difficult to measure it by anything very tangible; the student will need to gain his ideas by comparing several species. The metallic color of the face, and its alternative, the complete opacity of the face, might not seem to sound very definite, but I think they work out very well. I find hardly a species difficult to place by this character. The antennæ

generally are of little diagnostic value. They are always wholly black, except in some cases where there may be a whitish tip to the arista, which I do not find worth mentioning; in a few species the first joint of the antenna is elongated, and in *cerutias*, especially the male, there is a remarkable elongation of the whole organ (fig. 5). The width of the face and the color of the palpi are occasionally unusual and useful.

The thorax presents many opportunities for distinguishing species, especially in its chætotaxy. The scutellar bristles are uniformly four except in *gratiosus* (2), *intentus* (6), *plumbeus* (10), and *cerutias* (2). The numbers above four may be expected to be a little variable. The notopleurals are generally two, but are only one in *gratiosus*, *intentus*, *plumbeus*, *cerutias* and *agalma*. Not to prolong the list too much, the dorsocentrals vary in their size, some species having them large and others small; one species, *canescens*, has them white, a striking feature. The propleural (just above the front coxa on the side) shows some interesting changes; in *plumbeus* there are several, in all the rest one except *cerutias*, *canescens* and *agalma*, which have none; in *phoca*, the single propleural is yellow instead of black. The pleura often has fine, pale hairs in noticeable clusters in very definite spots, which I have mentioned in many cases. The halteres may be wholly yellow, or the knob may be more or less infuscated, and these two alternatives divide the genus more naturally than any other I can find, hence I have made primary use of them in my table. The wings offer few valuable characters. One of the first class is found in *cerutias*, but was overlooked by Loew—the extreme shortness of the second vein (fig 1). No other North American species has this peculiarity. The two spots on the wing in a few species are very constant, but other species have them in a very faint degree, also constant, which makes the character unavailable in a table except in one group. The paleness of the veins at the base is rather variable and I have found it of little use except in a few species. The abdomen presents very few salient characters. The hypopygium of the male varies so much in drying that it is almost impossible to make any use of it, while in other Dolichopod genera it is often of the greatest use and value. The legs except the front ones offer few characters. I have paid considerable attention to

the small black bristles of the front coxæ; while they are somewhat inconstant, they yield some good distinguishing marks. The front femora have on the under side some short stiff spines, against which the tibia closes with its row of spinules, thus holding the prey while it is devoured. This arrangement is repeated in many slightly varying forms in the different species, but in three, *canescens*, *amplectens* and *breviseta*, a secondary modification has taken place in the male, furnishing special grasping organs which must be for the purpose of holding the female, since they are confined to the male sex; in *amplectens* it is a question if the second function has not superseded the first. The middle and hind legs offer a few slight and one (*breviseta*) rather striking ornamental or other male characters.

In the measurements I have included the length of the wing, as the abdomen shrivels to such a variable extent that the length of the body becomes untrustworthy except in a general way.

Table of Species.

1. Knobs of halteres yellow.....2
   Knobs of halteres infuscated, at least on outer side.....13
2. Postvertical bristles in a row of six or more (fig. 4).....5
   Postverticals only two as usual.....
3. Scutellar bristles one pair.....**gratiosus** sp. nov.
   Scutellar bristles more than two pairs.....4
4. Propleural bristles several.....**plumbeus** sp. nov.
   Propleural bristles (black) none or only one.....**intentus** sp. nov.
5. Propleural one.....8
   Propleural none.....6
6. Second longitudinal very short, ending opposite hind crossvein (fig. 1).....**cerutias** Loew.
   Second vein normal, much longer (figs. 2, 3).....7
7. Dorsocentrals minute, white.....**canescens** Wheeler.
   Dorsocentrals small, black.....**agalma** Wheeler.
8. Face opaque non-metallic.....**aestuum** Loew.
   Metallic color visible on upper part of face.....9
9. Tip of front tibia in both sexes with an acute angle produced toward the femur (one to three bristles on upper outer corner of front coxa, and the face generally very bright blue-green as far down as the suture).....**philombrius** Wheeler.
   Tip of fore tibia not or but slightly angulated toward the femur (face not shining so far down, generally no bristles on basal part of front coxa).....10
10. Front tibia of male notched on inner side at two-thirds its length

(fig. 10) ..... **breviseta** Thomson.
Front tibia not notched 11
11. Size 3 mm.; pleura with rather thick white pruinosity ..... **sodalis** Wheeler.
Size 4.5 mm.; pleura with thin yellowish pruinosity .... **magdalenæ** Wheeler.
12. Wing with a brown spot on the middle of the last section of the fourth vein, and another on the hind crossvein (fig. 2) 1
Wings without these spots 18
13. Face opaque non-metallic 14
Face showing some metallic color 17
14. Face brownish-yellow, a gray spot on each side below .... **signiferus** Coq.
Face not so marked 15
15. Front coxæ with black bristles on the front side besides those at tip 16
Front coxæ with no black bristles except at tip ..... ♂ **algens** Wheeler.
16. Wings with the spots distinct enough to see with the naked eye. **chrysologus** Wlk
The spots only faintly visible with a lens ..... **pirata** Loew.
17. With a black propleural bristle ..... ♀ **algens** Wheeler.
With a pale bristle or stout hair ..... **phoca** sp. nov.
18. Face wholly opaque 19
Face showing some metallic color 20
19. Front coxa with a row of black spines in front, longest above, running out apically ..... **parvus** Loew.
Front coxa with a row of spines, longest toward the tip, running out proximally ..... **pirata** Loew.
Front coxa with no spines except at tip ..... **extrarius** sp. nov.
20. Front coxæ with long and striking spines on the basal part in front ..... **innotatus** Loew.
Front coxæ with no spines on basal part in front 21
21. Cheeks projecting downward in a small lobe below the eye ..... **altivagus** sp. nov.
Cheeks not forming a lobe below the eye, very narrow 22
22. Male with a protuberance preceded by a tuft of small spines on the under side of front femur near tip (fig. 13) ..... **amplectens** sp. nov.
Male without such structure 23
23. Upper part of the face bright blue-green ..... **pensus** sp. nov.
Upper part of face dull, only a little greenish ..... **extrarius** sp. nov.

DESCRIPTION OF SPECIES.

(Made with Zeiss binocular dissecting microscope, 30 diameters.)

Hydrophorus gratiosus sp. nov.

Male. Occiput bluish-green above, with moderate whitish pruinosity; postvertical bristles rather close together, with about four bristles each side, forming a row that joins the postorbitals both ways; the latter extending below the middle of the eye, beard whitish, a few stiff black spines showing just below the neck; front with dense brown pruinosity, not shining; face dirty whitish pruinose, not shining, of medium width; palpi of moderate size, black in ground color, opaque

like face, with mostly whitish hairs; antennæ with rather long first joint, the third wide, all black. Dorsum of thorax moderately shining, with two brown lines in front, in the middle brown, back of the middle a little coppery on both sides; humeral bristles one or two, scutellar one pair; a bunch of long, whitish hairs behind humerus and above the notopleural suture, pleuræ densely whitish pruinose, not shining, with conspicuous whitish hairs on propleura and hypopleura, the propleural bristle however black; halteres yellow with brownish base of stalk. Coxæ all with yellowish-white hairs and no black ones even at tip of front coxæ; femora rather opaque, with slight greenish metallic color, tibiæ and tarsi gradually a little darker; fore femur with numerous short, stiff spines below, arranged very indistinctly in two uneven rows; fore tibia on inner side with a row of short spines, the last two or three at tip becoming erect and slightly longer; the tibia itself is provided with a slight process at tip, turning toward the femur, on which the longest spine stands; fore tarsus fully double the tibia, pulvilli brownish. Wings smoky, costa wholly blackish, an indistinct brown cloud on the hind crossvein and another beyond it on the fourth vein. Abdomen rather shining green, with black hairs above and whitish ones on the sides, the latter rather conspicuous; hypopygium embedded, not very conspicuous. Length, 4 mm.; of wing 4.3.

Female. Length 5 to 6.1 mm.; of wing 5.6 to 6 mm.; otherwise like the male.

Seventeen specimens, both sexes: Moscow, Idaho (type); Pullman, Seattle and Friday Harbor, Wash., dated July 19 and Aug. 2 and 16; Palo Alto and Redwood City, Cal., dated March 1 and April 12, 19 and 25. Three of the Washington specimens are from Professor Melander, while one from Palo Alto is from the collection of Stanford University.

Another male from Moscow differs in nothing but its minute size, 3.1 mm.

Hydrophorus plumbeus sp. nov.

Female. Wholly covered with dense plumbeous pruinosity, nowhere showing any metallic color. Occiput with a transverse row of black bristles including the postverticals, which are continuous with the infra-orbitals extending entirely to the mouth; the upper orbitals do not quite connect with this series, so there are half a dozen small black bristles on the upper orbit which are a little isolated from the ones on the orbit below; no black spines under the neck; front plumbeous, yet in oblique view rather blackish, not shining; face very wide, uniformly plumbeous, the palpi concolorous, in the described specimen opened out so that the base of the proboscis shows between—probably not the usual position; antennæ of moderate length, rather slender, the third joint truncated, arista short, its penultimate joint over half as long as the ultimate, which is hardly tapering at all except at the extreme tip, but ends in a very fine point. Thorax everywhere plumbeous, but with two fine dark lines running back from the front edge in the middle; humeri each with three or four bristles of various sizes; on the mesial side of the humerus a group of bristles, and another behind the humerus and above the notopleural

suture, where a cluster of whitish hairs occurs in some species (*gratiosus*), propleura with long white hairs and a bunch of black bristles above the coxa; metapleura also with white hairs; scutellum with a row of erect convergent bristles on the margin on each side, five or six in each; some supernumerary bristles also before the scutellum; halteres yellow. Front coxæ with white hair, long above and shorter below, and a row of small black bristles just above the trochanter; middle and hind coxæ with only fine white hair; front femur with irregularly placed spines of all sizes below, indistinctly arranged in a double inner and a single outer row; front tibia stout, gently curved, ending in a slight process with one conspicuous spine, the rest of the inner spines almost imperceptible; the other legs and all the feet somewhat bristly; pulvilli brownish; the legs in every part showing the characteristic plumbeous pruinosity of the species. Wings rather opaque whitish, with a faint brown cloud occupying all the apical two-fifths except a whitish spot in the first posterior cell, and another spot of deeper brown with its center in the basal part of the discal cell and diffusing into the surrounding cells; veins black.

Length, 5.6 mm.; of wing, 5.7.

A single female, Grand Coulee, Wash., Soap Lake, June 29, 1902, from the collection of the Washington State College through Professor Melander.

This species has so many well-marked characters that it is unnecessary to enumerate them. It was collected at a small lake of strongly alkaline water.

Hydrophorus intentus sp. nov. (fig. 4.)

Male. Everywhere covered with a dense pruinosity, yellowish except on the dorsum of the thorax, and front where it is brown; metallic ground color not visible except very slightly on the abdomen. Occiput with a row of spines extending each way from the postverticals and joining the orbitals rather far down the side; the orbitals extend down nearly to the lower border of the eye; behind them the usual beard is yellowish, and there are black spines under the neck; front seal-brown, face uniformly yellowish pollinose throughout, palpi concolorous in favorable light; antennæ wholly black, first joint moderately long and slender, third wide. Dorsum of thorax rather uniformly brown, humeri lighter; humeral bristles two or three, scutellar about three pairs which are convergent and rather erect, the outer sometimes considerably smaller; propleura with long yellowish hairs and one black bristle; metapleura with fine soft yellow hairs and a few still smaller behind the humerus, above the notopleural suture; halteres yellow. Hairs of the coxæ all pale yellow, long on front ones, which have some black spines on the hind side, next the body, hard to see. Fore femur with two rows of spines underneath, the outer of about seven quite uniform, the inner with four or five larger and an irregular intermixture of smaller ones; front tibia almost straight, with a row of small spines on inner side, the last one larger and erect, standing on a slight elevation; pulvilli brownish. Wings somewhat uniformly brownish, the veins almost black, not lighter at base, an almost imperceptible cloud on the hind crossvein and another

beyond it on the fourth vein. Abdomen very faintly greenish, cylindrical in middle, the hypopygium small and concealed, not cutting into the fourth sternite at all.

Length, 4.5 mm.; of wing 4.6.

Female. Differs only in having the abdomen wider in the middle, and showing a rather bright blue-green metallic color on the whole dorsal surface of the abdomen; also in the larger size, 4.9 mm.; of wing 5.1.

Forty-one specimens: Horse Neck Beach (type), Woods Hole, New Bedford, Chelsea, Cohasset, Chatham, all in Massachusetts; Atlantic City, N. J. The Mass. specimens are dated from May 14 to Sept. 8, and were collected by Messrs. Johnson, Hough and Melander. The New Jersey specimens are dated May 6, and were collected by C. W. Johnson, who informs me that this is the commonest salt marsh species. Professor Melander also reports it extraordinarily abundant in salt marshes at Woods Hole.

I received this from Mr. Johnson under the name of *viridiflos* Walker, but I do not see how it can be Walker's species. Walker's description is mostly made up of items that would apply to almost any kind of Hydrophorus, or in fact to many other flies; the only character which seems of any diagnostic value is "wingribs and poisers tawny; veins black, tawny at the base." I do not understand the distinction between wingribs and veins, but it seems clear that he was describing a species, of which there are several, in which the basal part of the veins is yellow. This character does not apply at all to the species here described. It suggests *æstuum* to me much more than *intentus*, as Walker mentions a length of 3mm.

Hydrophorus cerutias Loew (figs. 1, 5).

Male. Occiput bright green, with only one pair of postverticals; postorbitals about eight on a side, extending down only about one third of the way to the mouth; beard yellow or whitish, dense; cheeks not visible at all below the eyes; no black bristles under the neck; front yellowish or brownish pruinose; face long, narrow above, wholly white pollinose, palpi concolorous and with rather long pale hairs; antennæ located rather high and pointing almost vertically upward; all the joints elongated, but the third drawn out into a point along the upper edge (see figure); arista short, the basal joint flattened so as to look like the tip of the third antennal joint. Thorax quite bright green or bronze above, especially bright behind; scutellum with only one small decussate pair of bristles, acrostichals and dorsocentrals extremely small, humerals one medium and sometimes one small, notopleural one; a tuft of pale hairs behind the humerus, above the suture; pro-

pleura with long yellowish or whitish hairs and no black bristle; mesopleura with long hairs of the same color on the lower anterior part; metapleura just in front of halter with a conspicuous tuft, which blends with a similar but shorter one on the posterior upper part of the sternopleura; halteres yellow with brown root; all the coxæ with dense yellow or whitish hair on front side, the front ones with also a lateral tuft near base and no black bristles; front femur not much thickened, on under side with two irregular rows of stiff bristles, and in the rather wide space between the rows numerous irregularly placed short spinules; fore tibia with a row of short spines of increasing length and erectness towards the tip, where the last and largest spine is on a curved point of the tibia; in addition to this row there is on the outer side from it (laterad) another row of larger, more scattered, slanting spines, some ten in number; middle and hind femora slender, rather long, somewhat bowed. Wings slightly infuscated, unspotted, of medium shape, strikingly distinguished by the shortness of the second longitudinal vein, which ends opposite or a little before the hind crossvein (see figure); veins broadly yellow at base. Abdomen bright green, pruinose on sides below, with thin white hairs all over, longest and conspicuous on the sides of the basal joints; hypopygium bulky but short, bent under but not extending much forward. Length, 3.6 mm; of wing, 3.7 mm.

Female. Considerably larger and brighter green than the male; third antennal joint not drawn out into a point as in the male, yet all three of the antennal joints may be called elongated; the face and the pale hairs of the body surface are yellow, the the latter quite variable in depth of hue. Length, 5. 1 mm., of wing the same.

Three males and seven females: Douglas Co., Kans. (Univ. of Kans. Coll.); Brookings, S. D.; Pierre, S. D.; Boulder, Col.

This species has such a wealth of specific characters that a lengthy description seems almost unnecessary. The male has a very remarkable appearance as it goes skating across the surface of a pond, the long antennæ pointing upward like a donkey's ears. I well remember seeing it near Lawrence, Kansas, in June, 1893, though the males in my collection are not of my own capture, all being from the University of Kansas collection. The females collected by me in South Dakota and Colorado were not recognized at the time. It was Professor Melander's quick eye that first noticed the peculiarity of the second vein, not mentioned by Loew.

Hydrophorus canescens Wheeler (fig. 9).

Male. Occiput coppery red, with only one pair of postverticals; postorbitals about twelve on a side, ending opposite the neck; beard white, abundant, mixed under the neck with some black bristles, which seem rather large and numerous; cheek very narrow; front whitish pruinose, only in certain lights with a little coppery reflection; face wholly white pollinose, palpi concolorous with white hairs, antennæ short, of ordinary form. Thorax coppery red or even crimson on most of the dorsum, greenish about the edges, the acrostichals and all the dorsocentrals

except the posterior pair *white*; a single pair of scutellars; two humerals, two notopleurals (both large), one posthumeral; propleura with two clusters of long pale hairs, above and below, among the latter some have a rather dark appearance in certain lights, but there is no black bristle; on the upper part of the sternopleura is a cluster of long, loose, woolly, white hairs, very conspicuous; metapleura bare; squama pale yellow with white hairs; halteres yellow, a little brownish at the root. Front coxæ white pollinose and covered in front with long, erect and dense white hairs, no black spines or bristles at tip; front femora thick, not tapering for more than half their length, then with a deep, oblique excavation below cutting out more than half the thickness of the member, beyond which the under side is widened again in a thin longitudinal plate to the tip; the sloping proximal surface of the excavation bears a diagonal series of short black spines; the femur has rather conspicuous white hair on its outer side and on the inner side before the excavation are several much longer white hairs; front tibiæ strongly bowed out where they oppose the excision of the femur and bare on the flat opposing surface except for a row of minute black spines on the edge which continue, though very small, to the tip; on the underside of the femur near the base are a few short spines in a row; middle coxa with long, erect white hairs on outer part of the front side; middle and hind femora long, slender and somewhat bowed; hind trochanter below with a bunch of black spines which unite to form a tapering, sharp, thornlike process, very striking; middle tibia and tarsus shortened, not much longer than the femur, last tarsal joint flattened and enlarged, black. Wings rather wide with veins yellow at base to a variable extent, unspotted, evenly and moderately infuscated in color; first posterior cell narrowed at end, not much more than half as wide as the length of the posterior crossvein; alula with a row of long, white hairs. Abdomen coppery above, more or less obscured with white pruinosity; all the hairs of the abdomen are whitish and of unusual length, those on the sides near base quite woolly and very striking; fourth sternite projecting V-shaped; hypopygium moderately prominent but not uniformly so. Length, 4.8 mm; of wing, 5. mm.

Female. Color of face from pale yellowish to brownish; front femur gently tapering, not notched, below with an irregular double row of small spines; front tibia with a row of minute spines on inner side which does not extend to the tip. Length, 5.3 mm; of wing, 5.2 mm.

Seven males and two females: Lawrence, Kans., June, 1893; Brookings, S. D.; and Green River, Wyo., Sept. 1, 1896. I remember collecting the specimens at the edge of the river at Lawrence, and I at once noticed the peculiar front legs of the male. The Green River specimens were taken on an occasion when I had to wait between trains all day at the town, but I do not remember the species. My description does not sufficiently bring out the characteristic pale yellowish soft dull coloring of the whole fly, which suggested the specific name. Only the coppery dorsum and greenish abdomen are moderately bright. The type locality was forty miles north of Lusk, Wyoming.

Hydrophorus agalma Wheeler (fig. 12).

Male. Occiput rather coppery green, with one pair of postverticals; postorbitals about a dozen, descending about a third of the eye-height; beard white, abundant and long, no black bristles under the neck; the eye meets the mouth, so there is no cheek; front opaque whitish in side view, but coppery with light from behind; face wholly white pollinose, palpi of same color, with white hairs; antennæ small, of ordinary form. Thorax with strong coppery reflection on the disk, mostly outside the dorsocentrals, a dark line in front on each side of the acrostichals. The acrostichals and dorsocentrals are very small in front, but black; hindmost ones very large; scutellar two pairs, large; humeral two, small; notopleural one; pleuræ densely whitish pollinose; propleura with two tufts of long white hairs, one above the other, but no black bristle; sternopleura on the upper part with some scattering very long white hairs; pleuræ otherwise bare; metapleura just in front of the halter with a peculiar protuberance, almost hemispherical; halter yellow with brownish root. Front coxæ whitish pollinose, with abundant long white hairs in front and no black spines; front femur tapering, below with a row of short, blunt spines extending nearly to the middle, about eight in number; front tibia rather straight, with a row of slanting black spines on the front (outer) side, and on the inner a very close row of minute black spinules, rather erect, ending at the tip with two larger small spines; the tibia has on the outer side two or three regular rows of pale hairs; middle femur with a row of long white hairs or bristles on the lower side; the middle tibia and tarsus are rather short, and the last joint of the latter is flattened and black; middle and hind legs provided with an unusual amount of fine white hair. Wings unspotted, rather broad, slightly infuscated, the veins broadly yellow at base, alula with a conspicuous fringe of white hairs, first posterior cell considerably narrowed at tip. Abdomen with a dull coppery reflection, the hairs all white and very long on the sides near the base. Hypopygium bulky, but mostly concealed. Length, 5.2 mm.; of wing, 4.9 mm.

Female. The pollen of the body is a little yellowish, and the face is decidedly yellow; the front femur below has an irregular double row of spines, 25 or 30 in all; all the spines of the front tibia are larger; no white bristles under the middle femur; middle tarsus normal; sides of abdomen with shorter hairs. Length, 5 mm.; of wing, 5.3 mm.

Three males and two females, collected by me at Battle Creek, Mich., in the summer of 1897; Professor Wheeler's types were out of this lot.

The species has many interesting points of resemblance with *canescens*, but also has easily discerned differences.

Hydrophorus aestuum Loew.

Hydrophorus eldoradensis Wheeler.

Male. The whole insect covered with whitish pruinosity, less dense on the dorsum, which shows a little metallic color. Occiput with only two postverticals, and only six to nine postorbitals on a side, extending only about a third of the way to the mouth; beard white, no black bristles under the neck; cheeks hanging down as a vertical flap below the eyes, which is short antero-posteriorly; face very wide,

wholly white pollinose, antennæ of usual form, small, first joint not elongated. Thorax with two small cupreous stripes in front, enclosing the acrostichals and extending to the middle; outside the dorsocentrals is a wider cupreous stripe on each side abbreviated at both ends. These stripes are often but little visible. Scutellars two pairs, humerals two, notopleural one and sometimes another much smaller; squama pale yellow with white hairs; halteres pure yellow with a dark root; propleura with white hairs and one black bristle; a few microscopic white hairs on sternopleura; front coxæ with white hairs in front and few minute black spines at tip; fore femur on the under side with one row of spines of irregular size, larger along the middle. These are on the inner side of the folded tibia, but at the tip is a single spine that comes on the outer side. There is a little variation in these femoral bristles, and in one of Wheeler's cotypes of eldoradensis, a male, from Magdalena Mts., N. M., I find by removing the tibia that the femoral bristles consist of a series near the base of about five minute ones bent laterad and three larger ones near the middle, standing straight down; these all form a row as far as their insertion is concerned. Wheeler's description of two rows must refer to the female. Tibia with a row of setules on the inner side, progressively longer and more erect toward the tip, the last one still longer and standing on a sharp inwardly curved point of the tibia. Middle and hind femora simple, slender but not greatly elongated, both a little bowed. Wings hyaline, unspotted, of medium size, the veins broadly yellow at base; this yellow color varies greatly in different specimens, but generally the costa is yellow to a point about halfway between the tips of the first and second veins. Third and fourth veins quite strongly convergent at tips.

Abdomen more or less greenish, rather broad and short, covered with white hairs; the male appendages are so small and retracted that it is often difficult to determine the sex of the specimen. Length, 3.2 mm.; of wing, 4.5 mm.

Female. Postorbitals about a dozen on a side; bristles of the lower side of front femur in two rows, which are a little irregular near the middle.; Length, 4.5 mm.; of wing, 5.3 mm.

Thirty specimens, both sexes: Magdalena Mts., N. M., Aug-1894, W. A. Snow; Las Cruces, N. M., Aug. 23; 40 miles north of Lusk, Wyo., July, 1895; Palo Alto, Cal., Aug. 6, 1894 (all the seven preceding specimens are cotypes of Professor Wheeler's *eldoradensis*, from Professor Melander's collection); Texas, October 18, 1899; Jacksonville, Tex., Oct. 20, 1895; Tifton, Ga., Sept. 24, 1896; Biscayne Bay, Fla. (Mrs. Slosson); De Funiak Springs, Fla., Mar. 1, 1900; Brookings, S. D., one pair copulating on surface of water, Apr. 10, 1900; Moscow, Ida.; Pacific Grove, Cal., on seepage of sand dunes near sea beach, May 6, 1906; Palo Alto, Cal., Oct. 7, 1905; Redwood City, Cal., Apr. 25, 1906; California (Coquillett).

The type locality of *aestuum* was Newport, R. I., which with Johnson's recently published New Jersey records, nicely rounds

out the localities so that they cover practically the entire United States. This is undoubtedly the most wide-spread species that we have; it is also considerably variable in several of its characters notably the amount of white pruinosity it bears. A specimen sometimes looks quite metallic on one side, showing that a slight amount of rubbing easily takes off the "dull finish" provided by nature. The coppery stripes on the thoracic dorsum are sometimes only green, sometimes almost obsolete. In general, it may be described as a small species with considerable whitish pruinosity, opaque face, white hairs all over except the distal portion of the legs, and with hyaline wings, unspotted, the veins yellow at base. Loew failed to mention the paleness of the wingveins, which misled Professor Wheeler. Mr. Brues compared some of my material with Loew's types of *æstuum* at the museum of Comparative Zoölogy, and could find no material differences.

Osten Sacken, in his Western Diptera, p. 320, probably had this species,—the second undetermined species mentioned.

Hydrophorus philombrius Wheeler (fig. 14).

Male. Occiput moderately shining green, the postvertical bristles only a single pair, vertex considerably excavated on each side of the ocelli, which are on a tubercle; front shining green, concave, wide above; face concave above the middle, smooth and brilliantly shining, the metallic color usually continuing down over the suture, which is elevated on a protuberance; there is considerable variation in the brilliance of the color, even on the upper face, but it is always perceptible; below the protuberance sloping backward to the palpi, which are darker with brownish hairs. The cheek a thin sharp plate, yellowish sericeous, standing straight down on each side of the mouth; the face widens rapidly from a point just below the antennæ; the black postorbital bristles extend down behind the eye only about to the middle; beard whitish and dense, making it impossible to tell certainly whether there are any black bristles under the neck, though I think there are; antennæ short, the first and second joints of about equal length. Thorax above striped with green and coppery, the former color occurring along the rows of bristles; only a single row of acrostichals, beginning rather far back; dorsocentrals small except the hindmost one; scutellars four, strong; two humerals; the hind notopleural small; pleura rather dull with gray pruinosity, almost destitute of fine hairs; propleura however with whitish hairs, longest just below the single black bristle; front coxa with a somewhat sericeous whitish pruinosity, and fine white hairs, also at the upper outer corner two or three small black bristles and five or six on the outer side of the front near the tip; femur thick at base, rather bare, below with two rows of bristles at base, the outer of only about four rapidly increasing ones and the inner of five or six of rather uniform size, and beyond the latter a few extremely short little stubs showing above the surface; front tibiæ strongly curved inward at tip,

and bearing on the inner side a row of little spines, quite erect all the way, the terminal one not large; the other femora and tibiae quite shining; halteres yellow to dark yellow, the knob not with a darker spot, the stem dark at base. Wings almost hyaline, without spots, the veins yellow at base as far as the middle of the basal cells and the first vein farther, the costa however only pale halfway to the humeral. Abdomen greenish, short, with whitish hairs on the sides and below, fourth sternite divided, behind it a pair of blackish protruding flaps.

Length, 3.9 mm.; of wing, 4.2.

Female. Face generally not bright below, yet distinctly green in the concave upper portion; front coxæ with the black spines quite small; dorsum of thorax more opaque, hardly shining.

Length, 4.8 mm.; of wing, 5.5.

Thirty-two specimens: Battle Creek, Mich.; McHenry, Ill. Lawrence, Kans.; Brookings and Pierre, S. D.; Austin, Tex.; Moscow and Craig's Mt. in Idaho; Palo Alto and Pacific Grove, Cal.; Longmire's Springs and Coulee City, Wash. The last and the material from Texas and Illinois are from Professor Melander. Dates: Austin, Texas, Oct. 29 and Dec. 25; Palo Alto, Apr. 12; Pacific Grove, May 6; Brookings, S. D., Apr. 25; Longmire's, Aug. 2; Coulee City, June 25 and July 13. The species evidently has a long season as well as a wide distribution. The dated specimens from Brookings have some personal interest, as I collected them in the spring of 1890, just after I had decided, under the advice of Professor A. J. Cook, to take up the Diptera as a specialty.

Hydrophorus breviseta Thomson (figs. 10, 11).

Male. Occiput green, with a bluish pruinosity, postvertical bristles only two; orbitals extending about two thirds of the way down behind the eye, beard yellow, numerous stiff spines below the neck; front opaque brownish; face green above, below with some brown pollen; the eyes reach as far down as the lower edge of the face, and the cheek is in the form of a very narrow vertical plate; palpi dark brown with hairs of the same color; antennæ small and very short. Dorsum of thorax rather brown, not shining, with a row of small lighter spots on each side, where they intervene between the dorsocentrals; four large scutellars; pleuræ rather green in the middle, whitish pruinose below; propleura with conspicuous yellowish hairs and one black bristle; mesosternum with thin, pale hairs; halteres rather deep yellow. Front coxæ with scattered pale hairs and at tip a few small black spines; front femur thick at base, on its lower side at extreme base about five little black spines with some whitish hairs, then about the middle a row begins of very long bristles which decrease rapidly; front tibia with a swelling on the inner side, largest just beyond the middle, followed by a deep excavation, beyond which to

the tip the outline again rises; the outer side of the tibia is also crooked and convex over the excavation, and along almost its whole length has distinct, long hairs; the inner side is provided with a row of short, erect spines, beginning before the middle, interrupted at the excavation, and continuing again in only three or four spines to a point halfway between the latter and the tip, so that there are no spines near the tip at all, but only delicate pale hairs on the inner side, tarsi simple, with brownish rather large pulvilli. Middle femora slender, a little bowed; middle tibiæ with a few extra bristles on the inner side near the tip; tarsus a little shorter than the tibia, its first joint bristly on the inner and hind side, the last two joints black, flattened, and with a dense tuft of stout black hairs on the hind side of each; pulvilli and empodium rather large, brownish. Hind legs of ordinary form. Wings slender, but faintly infuscated, a rather distinct spot on the hind crossvein but none beyond, veins black, humeral and the large stem behind it somewhat paler; abdomen moderately shining above, rather long, strongly concave below; underneath the fourth segment are two flaps with yellow hair; terminal organs large, folded under.

Length, 3.9 mm.; of wing 4.8.

Female. Instead of the long bristles on under side of front femur, there are only a row of short, stiff ones; the front tibia is provided with a simple row of small slanting spines on the inner side, not interrupted and extending to the tip.

Length, 4.3 mm.; of wing, 4.9.

Four males and four females: three males and three females were collected at Friday Harbor, Wash., July 17, 1905; two males and two females, same locality, collected by Professor Melander on July 7, 1909; one female, Kanaka Bay, San Juan Island, Wash., (four miles from Friday Harbor) May 31, 1906; and one male sent me many years ago by Mr. Coquillett, Alameda, Cal., which is presumably just about the type locality.

Hydrophorus sodalis Wheeler.

Male. Occiput green, moderately shining, with only the usual two postverticals; front rather obscure green; face wide, shining green close to the antennæ, but with a white pollen covering the lower two-thirds; palpi brown; postorbitals scarcely coming down to the level of the middle of the eye—just ten on a side in the described specimen,— beard dense and white, no black spines under the neck; cheek forming a narrow vertical plate, densely white pollinose; antennæ small, first joint short. Thorax and scutellum greenish bronze, rather shining; acrostichals in a row of five, dorsocentrals sixin each row, the fifth longest, but all rather long, scutellar four, strong; pleuræ with dense white dust, especially below; propleura with long white hairs and one black bristle, no other hairs on pleura except a few microscopic white ones on the upper hind part of sternopleura; halteres dark yellow; wings almost pure hyaline, unspotted, third and fourth veins rather widely separated at tip. Color of veins black, scarcely lighter at base. Front coxæ with short white hairs, usually a few minute black setules at apex, and occasionally a

small black hair near base; front femora thick at base, below with white hairs on outer side and a row of about four stiff spines near base, on the inner side below with numerous black spines in one row, " five to seven spines in the broader basal portion of the femur are considerably longer than the other spines, which are inserted in two or three irregular rows." Inner side of the front tibia with a regular row of stiff spines, running up on a slight process of the tibia at its distal end. Middle and hind legs simple, tarsi blackish with yellowish pulvilli. Abdomen short and compressed, bronze-green, the hypopygium retracted. Length, 2.9 mm.; of wing 4.

Female. Beard and hair of front coxæ more yellowish; the postorbitals come down two-thirds the height of the eye—thirteen in number in the specimen. Wings a little more infuscated. Length, 2.7 mm.; of wing, 4.7.

The description is drawn from eight cotypes in Professor Melander's collection, Hunter's Creek, Wyo., Sept. 11, 1895, Lusk, Wyo., Aug. 26, 1895, and Black Rock Creek, Wyo., Sept. 13, 1895. I also have eight females, Marshall Pass, Colo., 10,856 ft., July 28, 1908.

Hydrophorus magdalenæ Wheeler (fig. 6).

Male. Occiput bronze-green, with some brownish dust and only two postvertical bristles; front opaque brown; face rather wide, slightly dusted allover, yet with the green metallic ground color showing through distinctly on the upper half, where the dust is brown; on the lower half the pollen is yellowish white; palpi dark brown pollinose; antennæ rather small, first joint a little stout at apex; cheek narrow, dependent; postorbital bristles about twelve, descending a little below the middle of the eye; beard yellowish, a few black spines under the neck. Thorax golden green, heavily overlaid toward the front with brownish dust, which extends down on the pleuræ and becomes gradually paler; six or seven dorsocentrals, two humerals, four large scutellars; propleura with long yellowish hair and one black bristle; a few microscopic scattered white hairs on the upper end of the sternopleura; halteres yellow; wings moderately broad, veins yellowish at base, the costa becoming black at the tip of the first vein or beyond it. Legs rather bright golden green; front coxæ with rather long whitish hairs and at tip a few small black setæ; front femora with white hairs and a short row of spines on the outer side below at base; on the inner side below a row of spines extending about all the length; tibia on inner side with a row of slanting spines, the apex of the tibia not enlarged toward the femur; all the tarsi blackish, with large, divergent claws and brownish pulvilli. Abdomen quite bright green, with long, almost woolly white hair along the sides extending to the tip in diminishing length; hypopygium concealed, the two flaps that project behind the lower part with rather long and dense white hair; fourth segment projecting V-shape below. Length, 3.5 mm.; of wing, 4.5

The female differs hardly at all from the male. Length, 4.6 mm.; of wing, 5.7.

Twenty-five specimens: Mt. Rainier, Wash., above Longmire's Springs, Aug. 3, 1905, and Marshall Pass, Colo., July 28, 1908. Compared with cotypes loaned me by the American Museum of Natural History.

I was in doubt about the identification until I had examined the cotypes, as in my material the costa is not yellow so far from the base as in Wheeler's.

Hydrophorus signiferus Coquillett.

(Copy of original description.)

Female. Upper part of the occiput, front and face opaque, densely brownish-yellow pruinose, a small gray spot below each of the facial tubercles; palpi brownish-yellow pruinose in the center, the edges gray; proboscis and antennæ black, third joint of the latter subquadrate, slightly broader than long; a notch at insertion of the arista and another opposite it on the lower side of the joint; penultimate joint of arista one-half as long as the last joint; bristles of occiput black, intermixed with a few pale yellow hairs. Thorax blackish, the margins and upper part of the pleura opaque, densely brownish-yellow pruinose (center of the dorsum may have been abraded in the single specimen before me), remainder of pleura white pruinose; scutellum opaque, densely brownish-yellow pruinose, bearing four bristles. Abdomen shining bronze green, the lateral margins and venter white pruinose. Coxæ and trochanters densely whitish pruinose, femora and tibiæ shining, bronze green, the tarsi black; front femora bearing a few short spines on the basal third of the under side. Wings grayish-hyaline, veins bordered with pale brown, a dark brown spot on the hind crossvein and another near the middle of the last section of the fourth vein; third vein toward its apex strongly curving toward the fourth; hairs of lower calypters pale yellow. Halteres yellowish, the knobs brown. Length, 6 mm.

Type.—No. 4052, U. S. N. M.

Bering Island, July–August, 1897. A single specimen collected by Mr. Barrett-Hamilton.

Hydrophorus algens Wheeler.

Face rather wide in both sexes, only moderately narrowed above, bulging and then receding below, with brownish-yellow dust, which is denser in the male, allowing nothing of the ground-color to be seen; in the female however the metallic blue-green color shows through, but is not very bright. Palpi with brown dust and mostly yellow hairs; front opaque brown; postorbital black bristles in a rather dense row, beard yellow; postvertical bristles only one pair. Thorax with thin seal-brown pruinosity extending down to the middle of the pleuræ, where it changes suddenly (viewed from in front) into glaucous; dorsocentral and acrostichal bristles erect, long and slender, about 10 dc in a row. A lighter color in spots between these bristles (in the row) gives the effect of three paler lines on the dorsum; four strong scutellars; propleural one, among yellow hairs; halteres dark brown, stem yellow.

Abdomen concolorous with thorax, glaucous on the sides to a little above the suture; hairs black above, pale on the glaucous portion; male appendages much retracted in drying, as usual. Front coxæ with abundant yellow hairs on fore side and no black spines at all; front femora only moderately robust, with yellow hair on inner side, long toward the apex in male; underneath at base outside the flexed tibia with four (male) to seven (female) smallish spines of increasing length distally; fore tibiæ almost straight, with a row of slender short spines on flexor side, stronger distally. Wings indistinctly brownish with the two dots plainly visible to the naked eye; none of the veins yellow. Length of male, 4 mm.; of female, 3.9 mm.

Redescribed from cotypes, one male and one female, collected by Wheeler at Two-Gwo-Tee-e Pass, Wyo., Sept. 12, 1895. The specimens were loaned to me for study by the American Museum of Natural history.

I have seen no more material in this species. It differs from *chrysologus* in having fewer spines on the under side of the front femur. *Chrysologus* is mostly eastern, but I have one male from Boulder, Colo.

Hydrophorus chrysologus Walker.

Male. Occiput, front, face and palpi wholly seal-brown pollinose, opaque; postorbitals one pair, postverticals about twelve in number on a side, extending down more than halfway behind the eye, beard deep yellow, abundant; cheek very narrow; palpi with brown hairs; antennæ rather small, with no unusual features. Thorax and abdomen deep brown above, somewhat shining; this color extends down on the pleura a short distance, and correspondingly on the abdomen, below glaucous. In one of the two males the abdomen is distinctly more greenish. Scutellar bristles two pairs, humeral two, notopleural two; dorsocentrals much smaller than in *pirata*, acrostichals minute; propleura with stout yellow hairs and one black bristle; remainder of pleura bare except a few microscopic hairs on the mesopleura; squama brown with yellow hairs; halteres brown, the middle of the stem yellowish. Front coxæ yellowish pollinose on the inner half of the front side, the rest somewhat glaucous, a row of small black spines running up the front outside the middle line; these spines are scattering and irregular; front femora not much thickened, below with two irregular rows of spines of uneven size and between the rows some minute setules; tibia straight, with a row of short rather inclined spines on the flexor side as usual, not ending with a longer spine; the other femora not especially slender nor elongated for this genus. Wings narrow, with black veins, almost hyaline with distinct spot on hind crossvein and another beyond it on the middle of the last segment of the fourth vein; these two spots can be seen with the naked eye against a white background. Fourth segment of the abdomen with a V-shaped projection below, more conspicuous in a shriveled specimen than in a normal one; the latter has two long lamellæ hanging down near apex, which are folded in in the other specimen, so the hypopygium does not look like the same structure in the two specimens. Length, 3 mm.; of wing, 3.5 mm.

Female. Very like the male and about the same size in some specimens; some unshriveled ones a little longer.

Seven males and fifteen females: Crawford's, Franconia and Mt. Washington, N. H. (Mrs. Slosson); New Bedford, Mass., April 20, 1896 (Hough); Provincetown and Eastham, Mass., (C. W. Johnson); Montreal, Quebec, Sept. 8, 1901 (G. Beaulieu); Battle Creek, Mich.; Boulder, Colo.

I at first identified this with *glaber* Walker, but according to the description that species has yellow halteres. The references in my catalogue under glaber, mentioning its occurrence in Alaska and New Hampshire, are probably this species.

Hydrophorus phoca sp. nov. (fig. 2).

Male. A small species with brown dorsum and spotted wings. Occiput greenish with only the usual postvertical bristles; front and vertex sealbrown, not shining; face of moderate width, with brown pollen, which is so thin on the upper half that the green ground color shows through very plainly; this part of the face has deep longitudinal corrugations; palpi dark brown; antennæ wholly black, the first joint short, hardly longer than the second; third joint also small; infra-orbital bristles extending down almost to the lower border of the eye, beard yellow, no black bristles below the neck. Thoracic dorsum brown above with two faint rows of lighter spots that intervene between the bristles of the dorsocentral rows; the posterior part of the thorax is damaged by the pin in the described specimen; scutellum rather bright green, with four large bristles; the bristles of the sides of the thoracic disk are much larger than those of the central part; two small humeral bristles; no hairs behind the humerus; propleura with yellow hairs only on its lower part, and above them a rather strong yellowish-brown bristle; no perceptible hypopleural hairs; both halteres missing in the described specimen. Front coxæ with yellow hairs, long above, and only two or three small black spines at tip; front femur thick at base, below with yellow hairs near base and in the same region a short row of only four or five black spines; the front tibia not much curved, almost straight, seemingly with only minute setulæ on the inner side, but in the specimen it is impossible to see the structures here very well; middle and hind femora long and slender. Wings slightly brownish, with a distinct brown spot on the hind crossvein and another on the fourth vein a little beyond, both distinctly visible to the naked eye; all the veins black to the base. Abdomen small and short, greenish above, pruinose on the sides and below, bearing pale hairs below and longer ones on the sides of the first segment above; the fourth sternite has a ridge in the middle, which is split from behind forward.

Length, 3.1 mm.; of wing, 4.4.

One male, collected by the late Rev. Mr. Livingston, at Corfield, Vancouver Island, B. C., dated 8-7-96; from Professsr Melander.

Hydrophorus parvus Loew. (fig. 3.)

Male. Minute brown species with wholly dark brown halteres. Occiput brown, one pair of postverticals, postorbitals twelve, extending about halfway down the eye; opposite the ocellar tubercle on the orbit an unusually long proclinate and convergent pair of bristles; beard white and rather thin, cheek narrow; no black bristles under the neck; front brown; face narrow above, yellow to brown, entirely opaque, palpi blackish; antennæ of medium size, not elongated, still the third joint protuberant at tip in the middle. Thorax sealbrown above the notopleural suture and glaucous below; two pairs of scutellars, one humeral and one or two hairs; one posthumeral, two notopleural, both large; seven large dorsocentrals in each row; acrostichals small; all these thoracic bristles are comparatively large; propleura with only a few small white hairs and one black bristle; mesopleura with only a few microscopic white hairs, the pleura otherwise bare; halteres wholly dark brown; squama brown, with yellowish hairs. Front coxa white pruinose, with very few white hairs, but a row of black bristles down the front side, largest at proximal end, tapering off into a few white hairs near tip; there are also a few black spines across the tip. All the legs below the coxæ dark green, he tarsi blackish; front femora below with about three stout spines near base, on the inner side with a row of small spines most of the length; front tibia on the inner side with a row of inclined spines, longer distally, but not ending in a prominent spine; middle and hind femora slender, a little bowed. Wing narrow, subhyaline, veins black, first posterior cell not narrowed, last section of fourth vein straight; last section of fifth vein as long as the posterior crossvein. Length, 2.6 mm.; of wing, 3.5 mm.

Female. Face brown, narrow; resembling the male very much in all respects. Length, 2.8 mm.; of wing, 3.6 mm.

Three males and two females: New Bedford, Mass. (Hough); Hampton, N. H., April 17 and 22 and May 5, 1904 (from C. W. Johnson, collected by S. A. Shaw); Somerset, Mass., Dec. 31, 1904 (from C. W. Johnson, col. by N. S. Easton). The type locality was Illinois.

Hydrophorus pirata Loew.

Male. Occiput brownish pruinose, with one pair of postverticals; postorbitals about sixteen on a side, descending nearly to the lower edge of the eye; beard rather light yellow; cheek rather narrow; front and face opaque brown, palpi dark brown with black hairs; antennæ of ordinary structure, but the first joint a little elongated. Dorsum of thorax and abdomen sealbrown, this color extending a little below the notopleural suture and correspondingly on the abdomen, the side of the body below being densely white pruinose with a slight glaucous tinge; scutellar bristles two pairs, humeral two, notopleural two, the dorsocentrals much smaller, yet not so small as in some species, about 11 in number, the next to the last largest; propleura with a few delicate yellowish hairs above, some coarser ones below that seem almost brown in certain lights, and one large black bristle; pleuræ with no other hairs except a few microscopic whitish ones on mesopleura; squama brown with yellow hairs; halteres with brownish stem and very dark, almost black, knob.

Front coxæ with a row of about sixteen black bristles on front side, more slender and delicate above, and with rather dense hairs on the mesial side of the row; femora and tibiæ somewhat shining green, the former only moderately thickened at base, below with a scattering row about ten short spines on the inner side, extending the whole length, and on the outer side six or seven forming a row on the basal half; tibia with a row of spines on the inner side, not erect nor enlarged at tip, and the tibia is not bent toward the femur at apex. The middle and hind femora bright green, rather slender. Wings a little infuscated, with black veins, a slight cloud on the hind crossvein, not very apparent but constant. Abdomen showing a little green above, the sides of the two basal segments with rather woolly brown hair; hypopygium mostly concealed. Length, 4 mm.; of wing, 4.9 mm.

Female. All that I have seem to have the abdomen shortened in drying, otherwise not differing from the male. Length 3.6 mm.; of wing, 5.1mm.

Fourteen specimens both sexes: Franconia and Crawford's, New Hampshire, (Mrs. Slosson); New Haven, Conn., Oct. 21, 1903 (C. W. Johnson, collected by H. L. Viereck); Danvers, Mass., Sept. 23 (C. W. Johnson); Montreal, Que., Sept. 1, 1901 (G. Beaulieu).

In some specimens there is a distinct metallic reflection on the upper half of the face when the light comes from straight in front or a little below.

Hydrophorus extrarius sp. nov.

Female. Occiput moderately shining green, with one pair of postverticals; postorbitals about fifteen, descending hardly to the middle of the eye; cheek very narrow, beard white; no black bristles below the neck; front brownish pollinose, in some lights dark greenish; face rather narrow for the sex, somewhat pollinose all over, yet on the upper, concave part a dull green shows through the brown dust; lower convex part of the face with dense brown dust in the middle, and whitish on the sides; palpi gray, with mixed whitish and black hairs; antennæ of plain structure, a little longer than in some species. Thorax rather seal brown above, brighter green behind; at the notopleural suture this changes to glaucous; scutellar bristles two pairs, notopleural two, humeral two rather small, dorsocentrals fairly well developed but slender, acrostichals except at extreme front of the same size as the last. Propleura with white hairs and one black bristle; sternopleura with only a few microscopic pale hairs; squama yellow with whitish hair; halteres yellow, with a large brown spot on the knob. Front coxæ glaucous, with dense, short white hair in front and no black spines except two or three short ones at the tip; front femur not very much enlarged, below with a short row of five or six spines on the outer side at base and another short row on the inner side toward the tip (in one specimen a few small scattering spines continue this inner row toward the base more than in the other one); front tibia straight, with the usual row of small spines on the inner side quite slanting, not enlarged toward tip; middle and hind femora rather slender and a little bowed; wings almost hyaline, unspotted, veins

black at base, third and fourth veins not appreciably convergent at tip. Abdomen rather bright bluish green, glaucous underneath, hairs of the bright part black, of the glaucous part white. Length, 3.8 mm.; of wing, 5.1 mm.

Two females: Brookings, S. D. (type) and St. John's, Quebec, Aug. 8, 1901, the latter collected by G. Beaulieu, his number 46.

I hesitated a long time before describing this species. After long consideration I satisfied myself that it is recognizably distinct, even in the female sex alone, so for the sake of completeness I give it a name. Its relationships are with *pirata* perhaps more than any other species, but the absence of procoxal spines and the different color of the face, with other characters, are sufficient to distinguish it.

Hydrophorus innotatus Loew.

Male. Occiput green, with brown dust, not bright, only two postverticals; front opaque brown; face bright green above with only a little brown pollen, changing to white above the suture and densely covering the lower half; palpi brown; cheeks forming narrow flaps; the black postorbital hairs about 18 in number, descending two-thirds of the way to lower edge of the eye; beard yellow, dense, mixed under the neck with a few black spines; antennæ short and small, first joint hardly larger than second. Dorsum of thorax and abdomen rather uniform sealbrown; scutellars two pairs, acrostichals in a rather dense row, dorsocentrals slender in front, the posthumeral strong; pleuræ glaucous except irregularly along the upper part, where they are brown like the dorsum; propleura with yellowish hairs and one large black bristle; halteres with brownish knob; wings hyaline, veins black. Front coxæ glaucous, with very small white hairs and a conspicuous row of black bristles, about seven in number, longest at the base, placed rather on the outer side of the member; these bristles do not quite reach to the apex, but after an interruption there are more placed somewhat transversely across the tip; front femur below with a row of short but stout spines on the inner side, smallerand irregularly placed near the base, and on the outer side a row consisting of three or four rather large spines at base and beyond them as many more notably large, long ones, standing far apart, the last a little beyond the middle; front tibiæ with a very regular row of small inclined spines, not larger at tip, where the tibia curves slightly toward the femur; the other legs of plain structure. Abdomen short, brown down on the sides almost as far as the suture, glaucous underneath; hypopygium small, fourth sternite projecting V-shaped, this and the lobes of flaps behind bordered with whitish hairs; sides of abdomen with yellowish hairs near base.

Length, 3.7 mm.; of wing, 5.2 mm.; the latter indicates that the specimen is abnormally shortened in drying, or else has naturally a very short abdomen.

The female has a wider face, and the dust is wholly brown on the lower part, except just below the suture on each side, where it shows a tendency to a white spot as in signiferus. This is largely a matter of the direction of the light. Halteres distinctly brown on the knob, rather more so than some males. Length, 4.1 mm.; of wing, 5.2 mm.

Twelve specimens, both sexes: Beaver Creek, Newport, Oregon, Aug. 13, 1902; Keyport, Wash., Aug. 7, 1905; near Seattle, no date; Bellingham, Wash., July 29; Lyndon, Wash,. July 29, 1908. The last two lots mentioned are from Professor Melander, and the preceding one from Prof. O. B. Johnson. The type locality of the species was Sitka. Loew's description is easily recognizable and there can be no doubt of the identification.

Hydrophorus altivagus sp. nov.

Male. Occiput bright metallic green with faint brownish pruinosity; postvertical bristles one pair; postorbitals about fourteen on a side, extending a little over halfway down the eye; beard yellow, no black bristles below the neck; cheeks wide; front brownish pollinose, not much shining; face bright green on the upper fourth, the rest white pollinose; palpi strongly contrasting dark brown, with black hair; antennæ short, of ordinary form. Dorsum of thorax rather dark bronze-green, moderately shining; upper part of pleura concolorous with the dorsum for a narrow space; scutellar bristles two pairs, humeral two, notopleural two; dorsocentrals comparatively large for the genus, the penultimate one almost as large as the scutellars; propleura with long, delicate yellow hairs and one strong black bristle; mesopleura with a few microscopic pale hairs; squama yellow with yellow hair; halteres almost black, the stem yellow in the middle. The pruinosity of the pleura is almost white. Front coxa with abundant yellowish hairs on the anterior side; five or six black spines at tip and a row of black spines, four in the described specimen, running up the outer front edge from the tip about halfway to the base; front femur moderately thickened, on the inner side below with seven stubby spines forming an irregular row the entire length, on the outer side below there appear to be only two or three short spines at base; front tibia straight, with the usual row of small spines on the inner side; they are not erect, and are very uniform; middle and hind femora shining blue-green, not very slender. Wings large and rather broad, subhyaline, veins black, unspotted. Abdomen rather bright bronze-green above and on the sides almost to the suture, the rest whitish pruinose; hypopygium more concealed than usual. Length, 4.7 mm.; of wing, 5.1 mm.

Female. Face with yellowish-brown dust below, on each side below the suture changing to gray; palpi as in the male, blackish; front coxæ with one spine above the tip or none (this is evidently a variable character); spines on under side of front femur as in the male but somewhat longer. Length, 4.8 mm.; of wing, 5.6 mm.

One male, Marshall Pass, Colo., Alt. 10,856 ft., July 29, 1908; three females, Boulder, Colo., August, 1897.

Hydrophorus amplectens sp. nov. (figs. 8, 13).

Male. Postorbital black bristles about twenty-six in number, extending almost down to the lower corner of the eye, postverticals only two, beard pale yellow, cheeks exceedingly narrow; occiput green, front sealbrown, face rather narrow,

shining green above, on the lower part with brown dust; palpi dark brown with blackish hairs; antennæ plain, small, first joint not elongated; underneath the neck among the beard are rather numerous black bristles. Dorsum of thorax shining sealbrown, green before the scutellum and around the humeri, the acrostichal and dorsocentral bristles very small and thin and rather numerous; even the hindmost dorsocentral is thin and small; scutellars four; upper part of the pleura quite pure green, lower part glaucous pruinose, few almost imperceptible microscopic hairs on the upper part of the sternopleura; propleura with pale yellow hairs and one black bristle; halteres brown on the outer side of the knob; front coxæ with fine brownish hairs on the front side and small black spines at and above the tip; front femora not much thickened, with a single row of bristles below along the middle, about nine to twelve in number; near the tip below there is a prominence followed by an excision; just back of the prominence is a close row of five stiff and bluntly pointed spines; on the front tibia at the base is a slight lateral prominence about opposite the excision in the femur, surmounted with minute spines; following this to the apex is the usual row of small, rather erect spines; the effect of the excision and both prominences is evidently to form an organ for holding the female. The other legs of plain structure, except that the last two joints of the middle tarsi are black and somewhat flattened, the fifth joint more so than the fourth. Wings of moderate width, subhyaline, the veins black, with almost imperceptible spot on the hind crossvein and another beyond (in one specimen these are considerably stronger). Abdomen bright bluish green, glaucous only below and on the under part of the sides; fourth sternite emarginate behind and the space occupied with a large black organ which seems to end in a thin edge behind, quite different from most species. Length, 4.2 mm.; of wing, 4.8.

Female. The face is much wider, front and middle legs of plain structure. Front femur below with loose brown hairs and toward the tip a small spine or two. One female has the two spots of the wings more developed than the rest, but still faint. Length, 4 mm., of wing, 5.1 mm.

Three males and two females, all taken at Brookings, S. D.; three were captured in early spring of 1890. One male, Battle Creek, Mich., summer of 1897.

The female differs from that of *magdalenæ* in having much shorter dorsocentrals, no row of spines under front femur, and a brown spot on knob of halteres. The male differs in the structure of the fore legs and in having a narrower face, as well as in the smaller dorsocentrals.

Hydrophorus pensus sp. nov. (fig. 7).

Occiput shining green, only one pair of postverticals, the postorbitals about twelve in number, extending down only about one-third the height of the eye; beard white; no black bristles under the neck; cheek below the eye exceedingly narrow; front dark brown, hardly at all greenish; face narrow above, smooth and brilliant blue, below covered with white dust; palpi concolorous, with pale hairs; eyes with

larger facets just below the antennæ; antennæ of medium size, not quite so short as in some species, arista rather long. Dorsum of thorax sealbrown in front, green behind; four scutellars, two humerals, dorsocentrals of moderate size, the hind ones rather strong; pleuræ wholly white pruinose, bare, propleura with white hairs and one black bristle; squama blackish with pale hairs; halteres yellow with brown spot on knob and brown root. Front coxæ white pruinose and with fine soft hair, at tip sometimes with a few small black spines, sometimes without these; front femur with an irregular row of spines below, larger and smaller mixed and toward the tip on the inner side two or three longer ones; front tibia straight, with a uniform row of nearly erect, even, small spines on inner side; middle femora long and slender, a little bowed; hind femora also long, not so slender, beyond the middle with numerous dense, curved bristles below; the femur tapers rapidly near the tip, almost excised below; all the claws and pulvilli small. Wing narrow, almost hyaline, unspotted, veins blackish. Abdomen bright green, with two long, brownish lamellæ projecting forward underneath, about half as long as the abdomen; fourth sternite bent forward in a V-shape. Length, 3.2 mm.; of wing, 4 mm.

Female. Face wider than in male, but still narrowed below the antennæ; about fifteen postorbitals on a side; hairs on palpi blackish; a few pale microscopic hairs on sternopleura. Length, 4.9 mm.; of wing, 5.4 mm.

Forty specimens, both sexes: Craig's Mt. Idaho (type), June, 1894; Moscow, Idaho, May 3, 1895; Potlatch, Idaho, June 20, 1907; Troy, Idaho, Sept. 26, 1896; Harrison and Juliaetta, Idaho, and Pullman and Seattle, Wash.

This appears to be the commonest Hydrophorus of the Pacific Northwest.

Walker's Species.

Under the name of *chrysologus* on a preceding page I have described a species which may be the one to which Walker gave that name, although there is no great certainty about the matter. His description of *glaber* offers no characters of significance different from that of *chrysologus*, except that in the former case he mentions the dark knob of the halteres, while in the latter he calls the halteres yellow, very possibly overlooking an infuscation of the knob. The two spots on the wing occur in both descriptions, and with the item about the halteres include almost all of distinctive importance. I know no spotted-winged species with wholly yellow halteres, though in *phoca* the question is yet open, owing to the loss of both halteres in the single described specimen. If the face is shining in *chrysologus*, it might be the same as *algens*, but the ambiguous expression used seems to indicate an opaque face: "head covered with golden bloom,

which is paler and brighter toward the mouth." The two descriptions of Walker may really refer to the same species, assuming that the brown spot on the knob of the halteres was overlooked in *glaber*.

Walker's *alboflorens* seems to approach *pirata*, having infuscated halteres and unspotted wings, but so many characters are omitted or vaguely mentioned that a decision is impossible.

His *viridiflos* has been identified with my *intentus*, but as I understand the expressions used, it is much more nearly related to *aestuum*, a widely different species. At least it is a small eastern species with the wings pale at the base.

These conclusions will show the uselessness of trying to "do something" with Walker's names. If anything, I have gone too far in assuming that I have identified one species. An examination of Walker's types is the only process that will settle the matter; even that will have only a bibliographical value, and will not advance entomology in the least, assuming that we already know all of his species under some name, which is highly probable. I have heard of one entomologist who in recent years did in fact examine a part of Walker's types of Dolichopodidæ, and who had the self-restraint on coming home to say nothing about what he found, deeming it best not to disturb existing nomenclature. And he is a man who has contributed vastly to entomology in more than one order.

THE DIPTEROUS GENUS DIOSTRACUS LOEW.

(Pl. 8.—figs. 15–18.)

By J. M. Aldrich,

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The genus Diostracus was founded by Loew in his Neue Beitrâge, VIII, 43, 1861, and redescribed in Monographs, II, 120, 1864; the entire second notice is merely a translation of the first, both as to the genus and the single species, with the addition of one or two unimportant comments.[1] The typical and sole species, *prasinus*, was collected by Osten Sacken in New York, presumably near New York City. It has apparently not been collected since

[1] Note.—On page 122 of the monograph, the expression regarding the middle tarsi, "the first joint about as long as the other three taken together," should have been translated "the first joint about as long as the following three," etc.

the time of its discovery; at least, there are no references to it in literature, and I have never seen it in any collection examined by me. The discovery of a second species in the Puget sound region enables me to add some chaetotactic characters, and for convenience I redescribe the genus.

Generic characters.—Male. Antennæ of medium size and simple form, first joint moderately elongated, hairy above, the second short, hairy above and below, the third short with a rounded tip and almost basal arista, which is of medium length and has a very short pubescence. Face wide, short, with a strong transverse suture, the lower part ending in a point in the middle; palpi very large, folded loosely across the front of the large, bulky proboscis, which extends broadly up under the neck. Occiput convex, nearly horizontal above, with a row of orbital bristles extending to the mouth and only sparse beard below; postvertical bristles two, verticals two, as large as the ocellar. Thorax with absolutely no small hairs on the dorsum except at the extreme front edge; no acrostichals; six strong pairs of dorsocentrals; scutellars one pair and several hairs on the edge; humeral one and a few hairs; notopleurals two; posthumeral one; supra-alar two; postsutural one or two small; propleural one rather weak; a row across the first abdominal segment. Pleura bare. Metanotum large, nearly horizontal. Abdomen with six visible segments dorsally besides the hypopygium, which is small but not much embedded; fourth sternite bent out in a V-shape. Hind metatarsus longer than following segment; hind coxa without an erect bristle on the outside. Wings rather long, third and fourth veins nearly parallel, ending in the apex, second vein ending a little before the apex, hind crossvein less than its length from the hind margin.

Female. Face still wider, palpi not quite so large, more pointed and hairy. Two good-sized postsuturals.

It will be observed that the added generic characters are not drawn from the type species; but the close correspondence of the new species with the type in all essential known characters of the latter makes it highly probable that the type shows these newly mentioned ones also. The relationships of the genus are evidently with Thinophilus, as stated by Loew; five species of Thinophilus examined by me all agree in having no acrostichals, but differ from Diostracus in having the first antennal joint bare and shorter, and in having one notopleural bristle instead of two. In most of their characters, including the large palpi, the two genera are much alike.

Diostracus olga sp. nov.

Male. Occiput thickly gray pollinose, showing only a little greenish ground color; postorbitals rather scattering, black, the row extending to the mouth; beard of only a few yellowish hairs; front short and wide, gray pollinose, ocellar tubercle

prominent; face grayish above the prominent suture, shining green below it: palpi large, yellow in ground color, with snow-white shining luster on the outer side, which has only a few hairs, of a yellowish-brown color, mostly along the upper or front edge; eyes prominent and rounded, extending much below the side of the face, but not much below the pointed middle of the face; antennæ wholly blackish, as described under the generic characters. Thorax pure bright green above, not very shining, with two narrow brown lines extending from the front almost to the scutellum, close together, also a long and rather wide brown spot on each side, extending about equally before and behind the suture; humeri and a stripe above the notopleural suture pruinose with whitish; pleura wholly covered with a thin greenish-gray pruinosity, which also covers the metapleura; propleura with a brownish bristle and one or two hairs; squama brownish, with yellowish hairs; halteres yellow. Coxæ and legs blackish, with little greenish luster, the tips of coxæ, the trochanters and extreme base of femora yellow, tips of femora and bases of tibiæ also yellow; front coxæ with thin white hair on front side and a few black bristles at tip; all the femora quite destitute of bristles except a preapical one on the middle and hind ones; tibiæ plain, with ordinary bristles; tarsi plain, with small pulvilli and empodia. Wings uniformly infuscated, the veins dark. Abdomen short, grayish-green, not shining, with black hairs, which attain the size of bristles only along the hind edge of the first segment, especially toward the sides; hypopygium with two black lamellæ hanging down from posterior part. Length, 4 mm.; of wing, 5 mm.

Female. Face wider, not very shining, rather grayish-brown below the suture, the palpi more pointed than in the male, covered with coarse black hair and grayish pollen, which is paler along the lower edge. The postsutural bristles are uniformly larger than in the male, always two on each side. Length, 4.9 mm.; of wing, 6.1 mm.

Three males and three females, collected by myself near Olga, Orcas Id., Wash., July 14, 1909. One male, collected by Professor Melander near the same place, July 28, 1909.

All the specimens were taken on rocks along a little brook in a very shady place.

The wholly yellow legs of *prasinus*, among other characters, easily distinguish it from *olga*.

EXPLANATION OF PLATE.

Fig. 1. *Hydrophorus cerutias* Loew, wing of male.
2. " *phoca* sp. nov. wing of male.
3. " *parvus* Loew, wing.
4. " *intentus* sp. nov. back of head, showing supernumerary postvertical bristles.
5. " *cerutias* Loew, side of head of male.
6. " *magdelenæ* Wheeler, side of head showing wide cheek.
7. " *pensus* sp. nov. abdomen and hind femur of male.

Fig. 8. *Hydrophorus amplectens* sp. nov. side of abdomen of male.
9. " *canescens* Wheeler, front femur and tibia of male.
10. " *breviseta* Thomson, front tibia of male.
11. " " " upper view of tip of left middle tarsus, male.
12. " *agalma* Wheeler, upper view of tip of middle tarsus, male.
13. " *amplectens* sp. nov., part of front femur and tibia of male.
14. " *philombrius* Wheeler, front femur and tibia of male.
15. *Diostracus olga* sp. nov., side view of male.
16. " " " front view of head of male.
17. " " " antenna of male outer side.
18. " " " wing of male.

NOTES ON THE DIPTEROUS GENERA PROPOSED BY BILLBERG IN HIS ENUMERATIO INSECTORUM[1]

My attention has been recently called to this work by Mr. Henry L. Viereck who was endeavoring to locate some genotypes in the Hymenoptera. A copy of this rare book was presented to the library of the Boston Society of Natural History by Mr. Samuel H. Scudder. In looking over the pages (112–123) pertaining to Diptera I find the following generic names:

"Tichodartha Eg.[2]—Mosillus Ltr.,—Musca Ol." No species are mentioned.

Under "1 Divis. alis divaricatis, 1 subdivis. antennis capite medio brevioribus," page 118, appears the following:—

"Blera Eg.—Eristalis Flln.—Syrphus Fbr. Ltr.—Musca Ol. *fallax* Svec. *Linn.* *cœmiteriorum* Svec. Linn."

Recognizing Cynorhina Will. (1886) as has been done by Verrall, (Brit. Flies, VIII, 590) *Musca fallax* Linn. becomes the type of Blera, or considering Cynorhina to be a synonym of Criorhina Meigen, 1822, and ignoring Penthesilea Meigen, 1800, Criorhina also becomes a synonym of Blera. *Musca cœmiteriorum* Linn. is a doubtful species considered by some to be the same as *Chrysogaster solstitialis* Fall.

"Dones Eg.—Doros Mgn. III—Syrphus Auct. Pler.—Scaeva Flln.—Musca el [Ol].

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[1] Enumeratio Insectorum in Museo, Gustav Johann Billberg. [Holmiæ] Typis Gadelianis Gadel, 1820.

[2] Eg. " Auctor hujus operis."

*abdomine elongato depressiusculo	** abdomine clavata
festivus Svec. Linn.	*conopseus* —— ——"

Musca festivum Linn. is a Chrysotoxum Meig. 1803, and *Syrphus conopseus* Fabr. is the type of the genus *Doros* Meig, 1803.

"2 Divis. Alis incumbentibus. 1 subdiv. antennis longitudine capitis vel ultra. Calicera Eg.—Callicera Mgn. Pnz. Ltr.—Bibio Fbr.—Syrphus Rss."

No species mentioned.

Under "11 Natio Dolichopides Palpis proboscide brevioribus; alis incumbentibus. Calomya Eg.—Callomya Mgn. Flln.—Dolichopus Fbr. Ltr. Wlck.—Musca Ol."

No species mentioned.

Under "13 Natio, Asilides. Capite transverso thoraci collo exserto adnexo. 1 Divis. Tarsis pulvillis duabus."

"Laphyra Eg.—Laphria Mgn. Ill. Ltr. Fbr. Flln.—Erax Scp.—Asilus auct. Pler.

gibbosa Svec. Linn.	*gilva* Svec. Linn
flava —— ——	*marginata* —— ——
ephippium —— Fbr.	*rufipes* —— Flln."

All of these belong to the genus Laphria Meigen 1803.

"19 Natio Culicides Antennis gracilibus, capite longioribus, ♂ valde plumosis l, verticillato-pilosis; ocellis nullis."

"2 Divis. Alis deflexis Cnips Eg. —Culicoides Ltr."

Of the above names only Blera seems to be of any special importance. C. W. Johnson.

ANOTHER IMPORTED CLOVER WEEVIL.

Among the Phytonomus received for examination this winter I find specimens that belong to a species apparently not hitherto reported from America. This latest accession to the list of our clover and alfalfa enemies is *Phytonomus meles* Fab.

Specimens have been identified from the following localities: Albany, N.Y., 9 July 1908 bred from red clover (Dr. E. P. Felt); West Point, N. Y., W. Robinson, 28 April 1908 (coll. Am. Mus. Nat. Hist.); Brooklyn, N. Y. (C. Schaeffer); Westchester Co., N. Y. (Schaeffer); Rockaway "washup" (Schaeffer); Rockaway Beach, N. Y. (E. A. Bischoff); New Haven, Ct., 28 May 1910 and Hamden, Ct., 16 May 1910 (A. B. Champlain); Framingham, Mass., 5 May 1909 (C. A. Frost); Ramsey, N. J., 31 May 1908 (Schaeffer); Hewit, N. J. (Schaeffer); Rahway, N. J., 23 July (Bischoff); Newfoundland, N. J., 30 May (Bischoff); Lake Hopatcong, N. J., 30 May (J. A. Grossbeck).

It has much the same color as the alfalfa leaf-weevil (*P. posticus* Gyll.) but the scales are cleft to the base as in *P. nigrirostris* and the thorax is much wider than in either of these species. E. G. Titus.

Mr. E. A. Bischoff (*in litt.* 18 Apr., 1911) states that this is the *P. Castor* of Smith's Cat. Ins. of N. J.

ON THE LATER EMBRYOLOGICAL STAGES OF THE HEAD OF *PRISTHESANCUS PAPUENSIS*. (*REDUVIIDAE*)

By F. Muir and J. C. Kershaw.

Mossman, North Queensland.

The authors, in a former paper,* based on anatomical studies of the adult heads of Hemiptera, drew certain conclusions as to the homologies of their mouth-parts. Wishing to see if these conclusions could be verified by embryology, the studies herein described were undertaken on the embryo of *Pristhesancus papuensis*.

For our present purpose it is only necessary to begin our descriptions from the fifth day after the eggs were laid.

5th day. (Fig. 1) At this stage the embryo is in a dorso-ventral position. The procephalic lobes are large, and the antennæ distinct. All the appendages are distinct, but the 1st maxillæ are plain, single lobes, as are also the 2nd maxillæ. There is no sign of the eyes. Two small lobes over the stomodæum represent the labrum.

6th day. (Fig. 2) There is a deep constriction between the procephalic lobe and base of antenna. The appendages are longer and the legs have two distinct joints. The embryo has a posterio-ventral position.

7th day. (Fig. 3) The first maxillæ are now two-jointed, the basal joint we will distingusih as the *maxillary plate*, the distal as the *maxillary seta*. The 2nd maxillæ are distinctly three-jointed. Legs also three-jointed. Eyes not yet apparent. Labrum more pronounced with the two lobes amalgamated.

8th day. (Fig. 4) The antennæ have partly unrolled, and all the appendages lengthened.

9th day. (Fig. 5) The maxillary plate and maxillary seta are separate up to their bases. The labrum has come forward and developed. The 2nd maxillæ have coalesced except at their

*On the Homologies and Mechanism of the Mouth-parts of Hemiptera. Psyche, vol. 18, Feb. 1911.

tips, and form the labium. The antennæ hang down with the legs. All the trophi are larger and more developed. The eyes are not yet visible.

10th day. (Fig. 6) The head is well formed with the eyes partly pigmented. The antennæ are long and repose in a ventral position between the first pair of legs, their basal part and the head-capsule having begun to grow forward to cover the bases of the mandibles and maxillæ. The labrum and clypeus are much longer and free. The mandibles are flattish bodies about twice as long as broad, lying above the maxillæ. The maxillary setæ have become twice the length of the mandibles and flattish, the maxillary plates have altered but little, and still retain a slight connection with the setæ at their bases. The 2nd maxillæ have coalesced to near their tips and are more distinct.

11th day. (Fig. 7) The head is distinct and the eyes much more pigmented. The bases of the antennæ have grown more forward along with the head-capsule, and enveloped the base of the clypeal region. The labrum is elongated. The labium is one piece with three distinct joints, and a more obscure basal one.

12th day. The articulations of the mandibles to the head-capsule have begun to assume their ginglymus character.

13th day. (Fig. 8) The forward movement of the head-capsule and base of antennæ has continued considerably, the bases of the mandibles and maxillæ appearing to be within the head-capsule. The lateral edges of the labium have begun to turn up and form the groove in which the setæ eventually repose.

14th day. (Fig. 9) The false sutures in the head-capsule are plain, showing the forward movement of the head-capsule and its fusion with the clypeal region, leaving only the labrum and the epipharynx free. The setæ are more slender and rod-like. The labium is distinctly grooved.

15th day. The head is more chitinized and pigmented, the greatest change being the more definite shape of the maxillary plate, the dorsal edges being in contact with the lateral edges of the labrum, and its ventral edges partly fixed to the basal part of the labium. The ginglymus articulations of the mandibles are distinct. The only connection between the maxillary plate and seta is by the protractor muscle.

16th day. (Fig. 10) The forward part of the head-capsule

has fused with the clypeus, the false sutures on the head-capsule are distinct. The retractor muscles of the setæ can be seen passing to the back of the head-capsule.

17th day. The head has become firmer; otherwise there is little change.

18th day. (Fig. 11) The pseudo-sutures across the head from eye to eye are distinct. The tips of the mandibles are barbed, and the maxillary setæ have their lateral edges turned up, and the outer sides of their tips corrugated. There are bristles on the labrum.

19th day. The maxillary setæ are three-ridged longitudinally (a central ridge, with the lateral edges turned up to form two lateral ridges).

20th day. (Fig. 12) A slight alteration in the pseudo-sutures of the head-capsule. The maxillary plates are firmer and more chitinous. Tip of mandible reaches to tip of epipharynx. Tip of maxillary seta reaches somewhat beyond tip of epipharynx. The seta-ends are still outside the labium, *i. e.*, not in the trough of the labium. The lateral edges of the labium meet along dorsal central line from tip to epipharynx. The basal joint of the labium has become fused with the head capsule, the gular region and the ventral part of the maxillary plates, the only free part being a small ventral sclerite to which the retractor muscle is attached.

21st day, 9 a. m. (Fig. 13) The tips of the setæ reach a little beyond the tip of the epipharynx. The epipharynx has slightly lengthened.

21st day, noon. (Fig. 14) There are slight changes in the pseudo-sutures of the head. The seta-tips remain as before. The second joint of labium is well defined. The labrum and epipharynx are well defined.

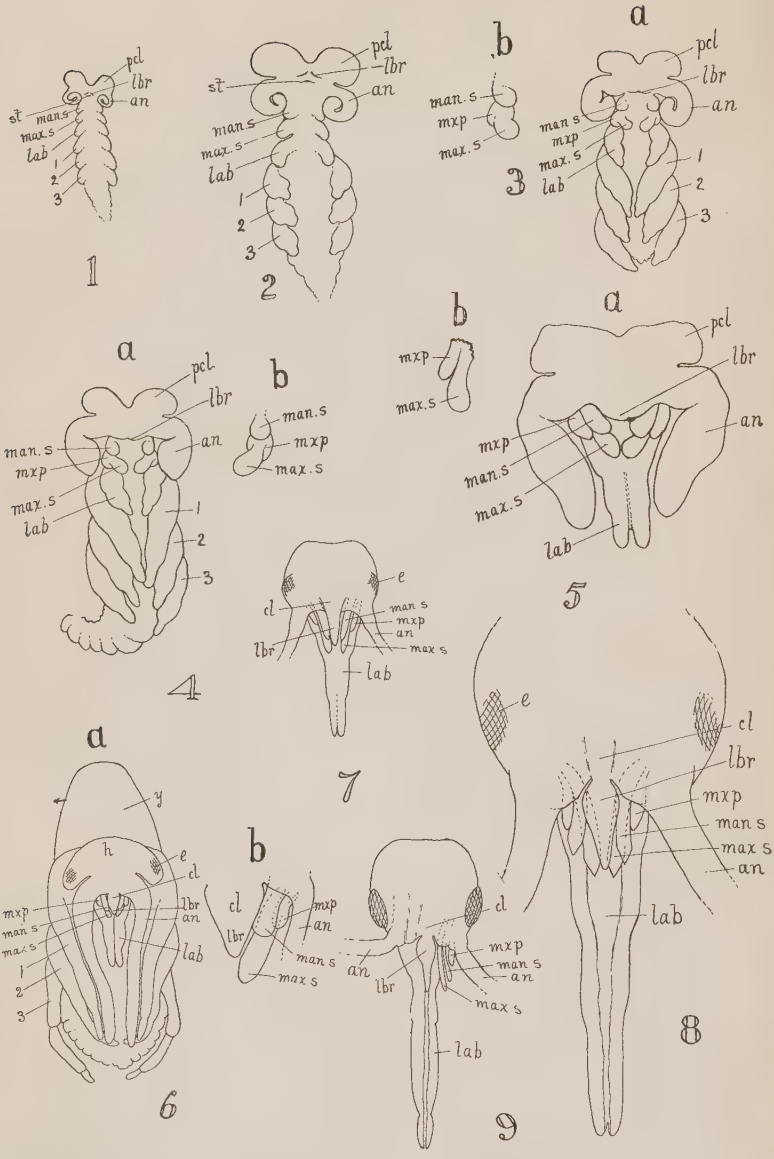
21st day, half-hatched nymph. The occipital region, hitherto partly invaginated into the prothorax, has greatly lengthened, owing to the straightening out of the head, and become chitinous. The 2nd joint of the labium has lengthened. The junction of the gular region with the basal joint of labium is complete. There is no line of demarcation between clypeus and labrum, but the epipharynx is distinct from the latter. The only pseudo-sutures remaining are those bounding the labral-clypeal region, and the deep transverse constriction between the eyes. In fact,

the head now much resembles that of an adult, but for the further lengthening out which reduces the large epicranial lump behind the eyes. The post-embryological development is very similar to that of *Sycanus croceovittatus*.

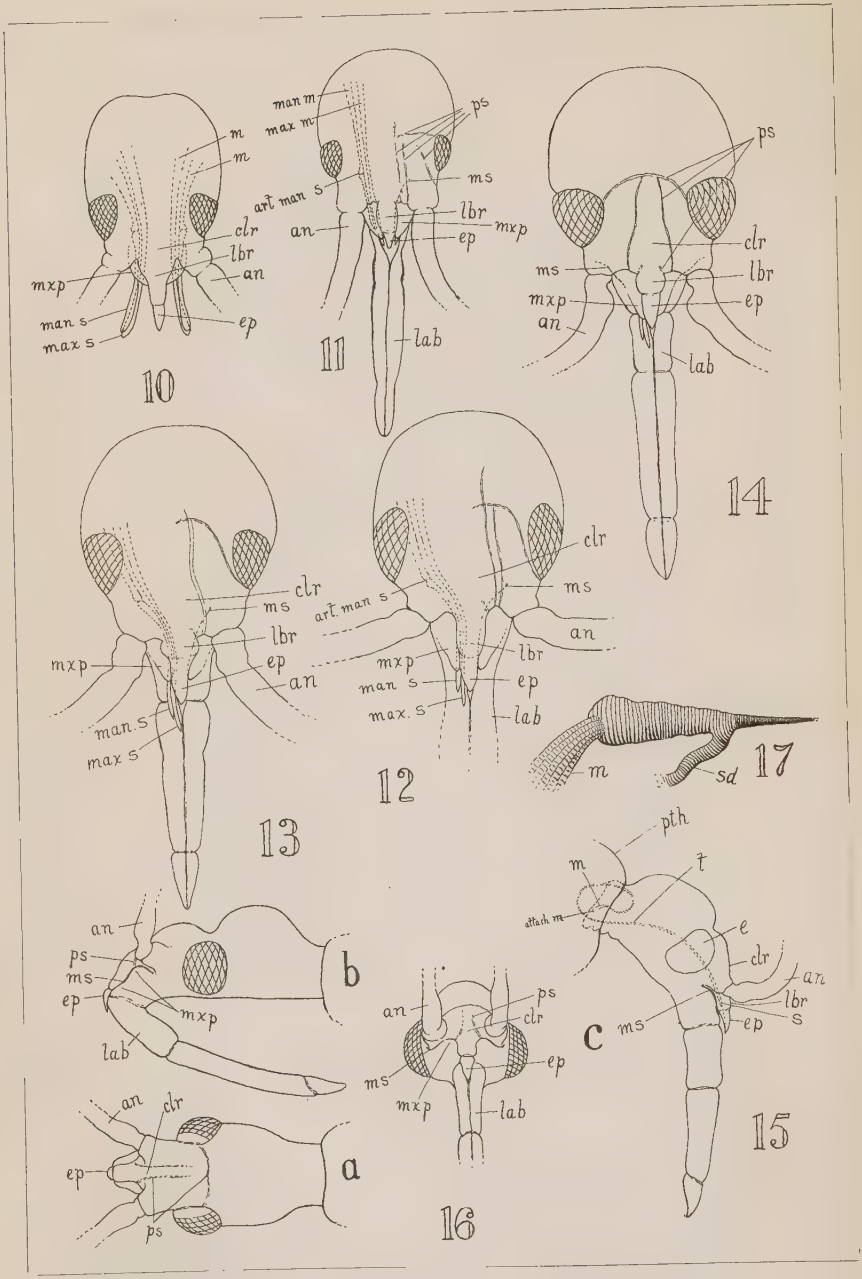
Up to the time of hatching the tips of the setæ project only a little beyond the apex of the epipharynx, and are free, but as soon as the young has freed itself from the amnion the tips of the setæ are placed into the trough, and pushed beyond the tips, of the labium. It is able to do this for two reasons; one, because during development the basal part of the seta, with its tendons and muscles, has grown back into the head and formed a loop which reached even onto the prothorax (Fig. 15 m. t. s.). This is straightened out at birth, and pushes the seta-tip through the trough of the labium. The second reason is because of a lengthening of the anterior part of the seta after casting the amnion.

These studies lead us to the following conclusions.

What is termed the frons by many writers we consider as clypeus, and their clypeus as labrum. The clypeal region is often very indistinct, and amalgamated with the head-capsule. The loræ (mandibular sclerites of Meek) have no connection with the mandibles, but are lateral developments of the clypeal region. The dorsal and outer pair of setæ are the mandibles, developed direct from the first pair of appendages behind the stomodæum of the embryo, and articulated in the normal position, viz.:—on the oral margin between the clypeus and maxillæ. The ventral and inner pair of setæ are *part* of the maxillæ, developed directly from the distal joint of the second pair of appendages behind the stomodæum of the embryo, the basal joint being directly developed into the maxillary plate (maxillary sclerite of Meek, Maxillarhöcker of Heymons). The complete amalgamation of this portion of the maxilla with the head-capsule, leaving no line or suture of juncture, is unique among insects, and constitutes one of the most difficult points for interpretation. In many Heteroptera the maxillary plate fuses with the lateral edges of the basal labial segment. The labium is formed by the entire fusion of the 2nd maxillæ. In many of the Heteroptera the basal joint fuses with the head-capsule and the ventral edges of the maxillary plates. The salivary syringe (salivary injector of Meek, Wanzenspritze of German writers) is homologous



MUIR AND KERSHAW.—PRISTHESANCUS PAPUENSIS.



MUIR AND KERSHAW.—PRISTHESANCUS PAPUENSIS.

to the claustrum salivæ (Hansen) of Diptera, and is a development of the salivary ducts. This can be plainly seen in the embryo about the fifteenth day, when the syringe is in the shape of a sack-like dilation of the common salivary duct, stiffened with spiral threads, eventually becoming chitinous, and tnd whe ehere the muscle is attached invaginated (Fig. 17). Our studies gave us no clue to the missing palpi.

EXPLANATION OF PLATES 9 AND 10.

Fig. 1.
Embryo of fifth day.

Fig. 2.
Embryo of sixth day.

Fig. 3.
Embryo of seventh day; a = embryo, b = Right mandible and maxilla.

Fig. 4.
Embryo of eighth day; a = embryo, b = Left mandible and maxilla.

Fig. 5.
Head of embryo of ninth day; a = head, b = Right mandible and maxilla.

Fig. 6.
Embryo of tenth day; a = embryo, b = Left mandible and maxilla.

Fig. 7.
Head of embryo of eleventh day.

Fig. 8.
Head of embryo of thirteenth day.

Fig. 9.
Head of embryo of fourteenth day.

Fig. 10.
Head of embryo of sixteenth day.

Fig. 11.
Head of embryo of eighteenth day.

Fig. 12.
Head of embryo of twentieth day.

Fig. 13.
Head of embryo of twenty-first day, 9 a. m.

Fig. 14.
Head of embryo of twenty-first day, 12 noon.

Fig. 15.
Head of nymph of twenty-first day, when nymph is half-way out of egg.

Fig. 16.
Head of nymph when just hatched out. a = dorsal view, b = side view, c = front view.

Fig. 17.
Salivary syringe of embryo about fifteenth day.

THE FOOD-HABITS OF MEGARHINUS.[1]

By Frederick Knab,
U. S. Department of Agriculture, Washington, D. C.

In a previous paper discussing the food-habits of mosquitoes I have expressed the opinion that the species of *Megarhinus* do not suck blood but feed wholly upon the sweets of flowers.[2] I was fully aware of the statements of some authors that these mosquitoes bite, but for several reasons I was convinced that these assertions are based on faulty observation or misidentification. Indeed I have failed to find any record at first hand of *Megarhinus* biting. Thus Theobald quotes Captain James that *Megarhinus immisericors* "bites very severely in southern India, and that its bite is very poisonous. It is known to the natives as the 'Stinging Elephant Mosquito.' "[3] It is to be judged from this quotation that Capt. James obtained his information from natives; we can safely put aside such evidence for there is little reason to doubt that, if there is any truth in the statement at all, other large mosquitoes were the real culprits. Later, on information obtained from correspondents, Theobald states of *Megarhinus separatus:* "They are called 'carapaná' and bite very badly in the daytime and at night."[4] The truth is that in the Amazon region "carapaná" is the vulgar name for any mosquito. We have here, then, another error of like character with that of Capt. James. This same mosquito is also accused by Goeldi on information from his entomological preparator, Mr. Adolphus Ducke, who assured him that its sting was comparable in severity to that of a wasp.[5] On the other hand good observers have expressed their belief that these mosquitoes do not bite. Bancroft says of *Megarhinus speciosus:* "It is not a biting mosquito."[6]

[1] In *Megarhinus* are included the species which have been placed in *Toxorhynchites* Theobald. I do not consider the character used in the separation of the two, the difference in the length of the palpi in one sex, as admissible for generic separation. Its introduction has only led to confusion and much needless synonymy. No attempt is here made to coördinate the specific names and they are used as given in the originals, *Worcesteria* Banks has already been disposed of by Professor Theobald (Monogr. Culic., vol. 5, 1910, p. 110).

[2] Journ. New York. Ent. Soc., vol. 15, p. 219 (1907).

[3] Monogr. Culic., vol. 1, p. 226 (1901).

[4] Monogr. Culic., vol. 3, p. 114 (1903).

[5] Os Mosquitos no Pará. Mem. Museu Goeldi, no. 4, p. 124 (1905).

[6] Ann. Queensland Mus., no. 8, p. 17 (1908).

E. E. Green controverts the idea that *Megarhinus immisericors*, the "stinging elephant mosquito" before mentioned, bites. "I have never experienced its bite, nor have I been able to induce it to bite me by method ssuccessful with other biting Culicidæ."[1] Very significant is the fact that within the last few years, when general attention has been directed to mosquitoes, no observations confirmatory of blood-sucking have appeared although *Megarhinus* have been recorded repeatedly as entering houses.

The most forcible evidence that *Megarhinus* does not suck blood lies in the structure of its proboscis. While all the parts found in the females of the blood-sucking species are present, the sheath, or labium, is strongly chitinized and rigid. This is not the case with the blood-sucking forms. The part played by the components of the proboscis when a mosquito pierces the skin has been common knowledge since the days of the immortal Réaumur and need not be discussed here at length. When the lancets are forced into the skin the sheath is pushed back and bent into a loop, and in this way the piercing parts are made to protrude beyond the tip of the proboscis to perforate the skin. It is therefore perfectly evident that *Megarhinus*, with its rigid proboscis sheath, cannot pierce the skin.

For those to whom the structure of the proboscis is not convincing it may be further stated that of a considerable number of *Megarhinus* which have come to hand not one shows traces of a blood-meal. Furthermore, in collections the males far outnumber the females, a goodly proportion of the species being known from the male alone, a condition the reverse of what obtains with the blood-sucking species.

Probably the first direct observation recorded, of a *Megarhinus* feeding, was that by the writer (l. c.) of a female *M. septentrionalis* sucking honey from the flowers of *Hydrangea arborescens*. Since then observations of *Megarhinus* visiting flowers for food have been made both in the eastern and the western hemisphere. I owe the following observations, which demonstrate very clearly that *Megarhinus* are honey-feeders, to the kindness of the well-known entomologist, F. W. Urich of the Board of Agriculture of Trinidad, British West Indies, sent under the dates of 1 Nov. and 6 Dec., 1910. "I had a rather good find a few days ago in

[1] Spolia Zeylanica, vol. 2, p. 159-160 (1905).

connection with *Megarhinus superbus*. At present there is a composite flowering called 'Christmas bush'; it attracts lots of insects of all orders and is very common near roads all over the island. What was my joy to see four *M. superbus* (2♂, 2♀) hard at work sucking its flowers! This particular plant was in the shade and it would appear as if these mosquitoes, although day flying, keep in the shade. I have repeatedly seen this species about during the day, but this is the first time that I actually found them feeding." In the second letter Prof. Urich informed me that the "Christmas bush" is the composite *Eupatorium odoratum* and added the following observation: "I re-visited the locality where I saw the *M. superbus* feeding and I was fortunate in again seeing and capturing, not only *M. superbus* (2♀, 1♂) but also *M. trinidadensis* (1♂). Time of feeding 10 a. m.; sun shining on flowers. Flowers growing on sides of road through cacao estate where there were many Bromeliæ on the shade trees."

From Africa we have the following observations, made by Dr. Graham in Ashanti and recorded in the last volume of Theobald's Monograph.[1] A female of *Megarhinus phytophygus* was "taken by Dr. Graham upon the flowers of a climbing plant." Of *Megarhinus marshallii* we read that it was found "on an umbelliferous flower in the bush at 12 noon (♂'s). Dr. Graham says 'Specimens were taken upon several occasions upon the flower of a climbing plant.' "

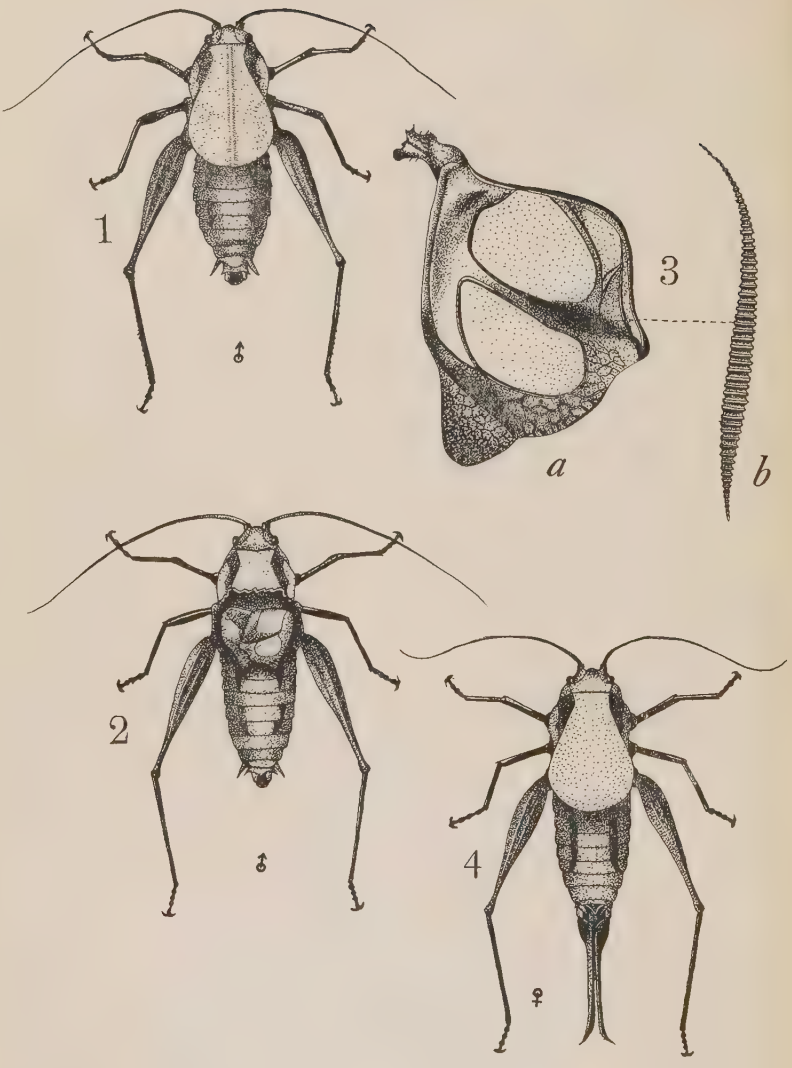
STRIDULATION OF THE SHIELD-BACKED GRASSHOPPERS OF THE GENERA *NEDUBA* AND *AGLAOTHORAX*.

By C. Pemberton.

Stanford University, California.

In many species of Decticinæ, the wings are so atrophied as to be almost completely gone, and the elytra are so reduced as to be almost wholly covered by the characteristic shield-like posterior extension of the pronotum. In some of these species the elytra of the males bear very highly developed organs for the production of sound.

[1] Vol. 5, p. 103, 105 (1910).



PEMBERTON.—STRIDULATION OF NEDUBA AND AGLAOTHORAX.

Species of the genera *Aglaothorax* and *Neduba* have been taken from a high range of hills a few miles west of Stanford University. In all of the species examined *no traces could be found of the elytra or wings in the female,* while the elytra were present in the males of all the species examined, and were practically of the same make-up in all the species. These short elytra in the male are admirably specialized for sound production. The elytra of a male specimen of a species of the genus Neduba may be taken as a fair example.

They are 5 mm. in length, and 4 mm. in width, and flat, except at the posterior and outer edges, which fold down over the body They are hard and brittle except at the tip, which is membranous. In the central portion they are very thin and drum-like, and divided diagonally by a tough chitinous piece on the under side. This piece is ridged transversely very finely, forming a file about 3 mm. in length. Along the lateral outer edge of each elytron just above the lateral end of each file, the edge is chitinized and tough, forming a scraper over which the file of the opposite elytron rests and may rub. One elytron covers about one half of the other. As the two elytra are exactly similar in construction, either the right or the left may be above and still be able to produce the sound. In some individuals the right elytron would be above and in some the left. This condition differs from that in most species of Orthoptera which produce sounds in a similar manner, for generally there is a definite unchanging position of the wing-covers.

By moving the elytra over one another the Neduba males produce shrill, high-pitched grating sounds, not continuous but intermittent. The chirps average about one hundred a minute. Sometimes the sound will be continued for several minutes; at other times for but a few seconds only.

EXPLANATION OF PLATE.

Fig. 1. Male, Neduba sp.

2. Male, with pronotum removed showing elytra.

3. (a) Elytron of male enlarged, showing the position of the file and the drum-like vibrators.

(b) File enlarged.

4. Female.

A NEW SPECIES OF LASIOPTERA WITH OBSERVATIONS ON CERTAIN HOMOLOGIES.

By E. P. Felt.

Albany, N. Y.

The gall midge described below was received from William H. Patterson of the Agricultural School, St. Vincent, W. I., under date of November 28, 1910 accompanied by the statement that it was reared from stem galls on purslane, *Portulaca oleraceæ* Linn. With this sending there was a Hymenopteron, associated with the gall midge, and presumably parasitic thereupon, which was determined by Mr. Crawford through the courtesy of Dr. L. O. Howard of Washington, D. C., as *Lochites auriceps* Ashm.

Lasioptera portulacae sp. nov.

Male. Length 1.5 mm. Antennæ short, sparsely haired; 14 segments, the third and fourth slightly fused, the fifth with a length about equal to its diameter, the distal segment slightly produced, narrowly rounded apically. Palpi; the first segment rectangular, second a little longer, narrowly oval, the third as long as the second, more slender, the fourth as long as the third. Mesonotum, scutellum, postscutellum and abdomen a nearly uniform dark brown, the first somewhat shining. Wings hyaline, costa dark brown, the discal spot small, whitish, subcosta uniting therewith near the basal third. Halteres reddish brown, fuscous subapically. Legs a variable yellowish-brown, the articulations of femora and tibiæ and the tarsal segments basally a light yellowish; claws stout, strongly curved, unidentate, the spur large, stout; pulvilli nearly as long as the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment strongly swollen basally; dorsal plate divided, the lobes narrowly rounded, sparsely setose apically; ventral plate rather broad, broadly rounded and sparsely setose apically. Harpes broad, irregular, strongly chitinized distally; style short, stout.

Female. Length 1.5 mm. Antennæ short, sparsely haired, dark brown; 19 segments, the third and fourth slightly fused, the fifth with a length hardly equal its diameter, the distal segment reduced, ovoid. Palpi nearly as in the male, the distal segment a little longer than the third. Color characters nearly as in the opposite sex, the ovipositor with a length nearly equal that of the abdomen, yellowish, the terminal lobes with a length three times the width, narrowly rounded apically and thickly setose; acicula apical, acute, and with a length twice that of the terminal lobes.

Exuviæ. Length 2 mm., whitish transparent, slender; antennal cases short, thoracic horns short, slender; wing cases extending to the third abdominal segment, the leg cases to the fifth, the dorsum of the abdominal segments thickly covered with short, stout spicules.

Larva. Length 1.75 mm., rather stout, whitish or yellowish-orange; breastbone slender, expanded distally, narrowly bidentate; posterior extremity broadly rounded.

Type C. a2113, New York State Museum.

The female of the above described Lasioptera is extremely interesting because of the terminal acicula being practically identical with the much better known needle-like appendage on the tip of the abdomen of Asphondylia and certain close allies. A study of this organ, to which we have applied the name acicula, shows that this structure in the two genera is homologous and, furthermore, that it occurs in a more or less developed condition among many of our gall midges, particularly those having a long ovipositor or with the acicula chitinized and modified to form a piercing organ. The acicula is essentially a chitinized rod arising from an arched, furcate base and tapering to an acute point. It may be apical as in Asphondylia, Schizomyia, Monarthropalpus, Sackenomyia and Trotteria, or subapical, less chitinized and frequently nearly concealed by other tissues. This latter obtains in many species of Lasioptera, Rhabdophaga, Dasyneura, Contarinia and numerous other genera. The acicula usually occurs at the base of the apical segment of the ovipositor and is occasionally forced out by the manipulation necessary in making a balsam preparation. In Baldratia and Stefaniella it appears to be composed of a pair of rather widely separated rods terminating in irregular, acute, subapical processes, while the minor lobe in these two genera is strongly chitinized, acute apically and may possibly serve as a piercing organ. This compound structure of the acicula may also be seen in Asteromyia and other related genera, though the two long rods composing its shaft are much more nearly approximate. The process of fusion is complete in the very effective acicula of Asphondylia. The development of this organ is somewhat less in Schizomyia, while in Trotteria it is a blade-like rather than an aciculate structure. Monarthropalpus and Sackenomyia both have the acicula modified to form a rather stout, curved, not particularly acute organ.

The recognition of the homology above outlined necessitates a careful examination of the apparently peculiar dorsal pouch of Asphondylia. A study of the structures on the distal segment of the ovipositor in Schizomyia, Monarthropalpus and Sackeno-

myia shows that in each case there are rudimentary lobes homologous with our "terminal lobes" at or near the base of the acicula. It is only a step from the conditions described in the Lasioptera named above, with its well developed terminal lobes and the apical acicula arising just below, to follow the reduction and migration of these organs cephalad as in Monarthropalpus and Sackenomyia, and to proceed from this to what we find in Asphondylia with its highly developed terminal lobes apparently at the base of the ovipositor. The relationship obtaining in the last named form is due simply to the mechanical necessity of having at the apex of the abdomen a sufficient length of invaginating tissue to permit the withdrawal of the extremely long acicula into the body of the female. Obviously, under these conditions there must be either reduction to practical extinction or migration, and in the case of Asphondylia the latter prevailed and was accompanied by an increase in size of the terminal lobes and their modification to form the peculiar dorsal pouch.

TWO NEW SPECIES OF HOLCASPIS FROM MEXICO.

By William Beutenmuller.

American Museum of Natural History, New York City.

Holcaspis weldi, sp. nov. (Plate 12, fig. 2).

Female. Head dusky yellowish brown, finely and evenly rugose, slightly pubescent. Antennæ dull brown, 14-jointed, rather stout, third joint long and slender, second subcylindrical, fourth joint shorter than the third and thick at the end, following joints shorter and sub-equal. Thorax dull yellowish brown, finely but distinctly punctate and slightly hairy. Parapsidal grooves distinct, and almost reaching the collar. Median groove continuous and broadest at the scutellum. Anterior parallel lines scarcely evident. Lateral grooves fine and not distinct. Pleuræ finely rugose. Scutellum dull yellowish brown, evenly rugose, with a linear depression along the middle and a groove-like depression across the base. Abdomen dark brown, paler dorsally, finely punctate and hairy along the sides. Legs dull yellowish brown, middle and hind femora darker, femora rather stout. Last tarsal joint and claws large and stout. Wings dusky hyaline, somewhat clouded, veins stout and brown. Radial area open. Areolet large. Cubitus almost reaching the first cross-veins. Length 3–4 mm.

Gall. In clusters on the terminal twigs and leaves of *Quercus reticulata*.

Monothalamous. Globular, thin-shelled, yellowish and tinged various shades of pink and red, covered with a dense rusty brown, pubescence, which may be rubbed off with the fingers. Inside there is a rounded kernel held in position by radiating

fibers which are covered with a moss-like substance. The inner side of the shell is densely covered with a rusty brown moss-like substance. Diameter 20–40 mm.

Habitat: Mexico.

The galls were purchased by Mr. Lewis H. Weld from a woman at a fruit stand on the street in the Mexico City and the specimens evidently came from the nearby mountains. The galls were bought September 12th, 1910 and the adults emerged between October 2nd and 9th. The oak was kindly identified for me by Dr. N. L. Britton.

Holcaspis mexicana, sp. nov. (Plate 12, fig. 3.)

Female. Head yellowish brown, rugoso-punctate and covered with pale hairs. Antennæ slender, filiform, the terminal joints scarcely thicker than the basal joints, 14-jointed, first joint stout, second very short and sub-globular, third to sixth long and slender, third the longest, seventh to thirteenth gradually becoming shorter, terminal joint longer than the preceding, all yellowish-brown. Thorax finely and, densely punctate, and covered with short decumbent dull yellowish hairs; anterior parallel lines and space between black, as are also the lateral grooves. Parapsidal grooves extending forward to the middle of the thorax. Anterior parallel lines, sharply defined, smooth and almost reaching the middle of the thorax. Lateral grooves long, smooth and sharply defined. Scutellum rugose, no foveæ. Pleuræ punctate, hairy. Abdomen smooth, shining with short hairs at the base. Reddish-brown, posterior end of second and third segment blackish brown dorsally. Legs dark yellowish-brown and hairy. Wings yellowish hyaline, veins dark brown and stout. Radial veins almost touching the costal marging. Areolet distinct. Cubitus terminating some distance from the first cross-vein. Length, 4 mm.

Gall. In a compact mass around the terminal twig of a species of oak. More or less rounded with the sides usually flattened and pressed out of shape. Smooth, somewhat shining, clay brown more or less tinged with red. Hard and woody with a single rounded larval chamber near the base of the gall and firmly imbedded in the hard inner substance. The individual galls measure from 8–18 mm. in diameter and the entire mass 30 mm. in length and 25 mm., in width.

Habitat: Guadalajara, Mexico. (D. L. Crawford.)

The specimen I received from Prof. C. F. Baker.

Explanation of Plate 12.

Fig. 1. *Holcaspis mexicana* sp. nov.
2. *Holcaspis mexicana* sp. nov. Inside view.
3. *Holcaspis weldi* sp. nov.

NOTES ON SOME GENERA OF BLATTIDÆ.

By A. N. Caudell.

U. S. National Museum, Washington, D. C.

The genus *Steleopyga* was established by Fischer von Waldheim in 1833[1] with three included species, *orientalis*, *americana* and *trichoprocta*, the last a new species and the first two, while not so listed, are known to be the *Blatta orientalis* of Linnæus and the *Blatta americana* of the same author. Now the type of *Steleopyga* must be one of the three above mentioned originally included species. The first of the originally included species, *orientalis*, is not eligible as it was designated as the type of *Blatta* by Latreille in 1810.[2] To date, so far as I know, *orientalis* is the only one of the originally included species that has been designated as type of *Steleopyga*.[3] The type is therefore as yet undesignated. The second originally included species, *americana*, has long been the designated type of *Periplaneta*, thus eliminating it from consideration as the type of *Steleopyga*. The third and last of the originally included species, *trichoprocta*, becomes therefore the type of *Steleopyga*.

Blatta aegyptica Linnaeus, the type species of the genus *Polyphaga* of Brullé, has as a synonym the *Steleopyga trichoprocta* of Fischer, shown above to be the type of *Steleopyga*. Thus *Polyphaga* Brullé and *Steleopyga* Fischer, having synonymous species as types, are themselves synonymous. *Polyphaga* therefore falls as a synonym of *Steleopyga*, being the more recent by two years. 2 Blatt., p. 30 (1907), designates *Blatta rhombifolia* Stoll as type of *Stylopyga* but it is not an originally included species of that genus.

In 1846[4] Fischer introduced a different spelling of his genus *Steleopyga*, spelling it *Stylopyga*, crediting it to himself, quoting the reference to its original proposal in 1833 and including but a single species, *Blatta orientalis* Linnæus, which is figured. This is obviously but a different spelling, or an emendation, of *Steleopyga* but it has recently been used as a distinct genus by Mr. Shelford,[5]

[1] Bull. Soc. Imp. Nat. Moscou, vol. vi, p. 356, 366 (1833).
[2] Consid. Crust., Arach. & Ins., p. 246.
[3] Shelford, Sjöstedt's Expedit. Kilim. Meru &c., 17, Orth.
[4] Orth. Russie, p. 68.
[5] Genera Insectorum, Fasc. 109, p. 14 (1910).

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BEUTENMULLER.—NEW HOLCASPIS.

who quotes the original *Steleopyga* in the synonymy under Blatta. The only species, *orientalis*, included under this emended form by Fischer is not included by Shelford, who uses the name for a group of species typlified by the *Blatta rhombifolia* of Stoll. This group of species which Mr. Shelford lists under *Stylopyga* is separable from the species of the genus *Blatta* only by the length and development of wings in the male and can thus all be logically referred to that genus. Therefore the twenty-five species listed by Shelford in the above paper are transferred to the genus Blatta.

The genus *Dorylæa* of Stal is very closely allied to *Blatta* and will eventually very likely prove a synonym of that genus.

LUCILIA SERICATA AS A HOUSEHOLD PEST.

By A. P. Morse,

Wellesley College, Mass.

In October, 1910, a lady asked me, "Why do worms prefer oriental rugs to Wilton carpets?" Inquiry revealed the fact that one of her friends was finding large numbers of white "worms" under her oriental rugs.

Naturally my first thought was of fleas and Dermestid larvæ, but the description was at variance with either, neither dogs or cats were about, the rugs had been recently cleaned, and the house was immaculately kept,—so I requested samples. In a few days a vial containing several Muscid maggots and a puparium was received. Careful questioning in regard to food material for such creatures finally secured the information that a squirrel family had been evicted recently from one of the chimneys and that one of the young squirrels, it was believed, had died in the flue. This clue accounted satisfactorily for the presence of the troublesome maggots and the sequel. With this introduction, the following extracts from letters concerning the outbreak will be self explanatory, due allowance being made, if thought necessary, for a possible, but under the circumstances, very pardonable, exaggeration in regard to the numbers of the pest.

[Nov. 23] "Mrs. ——— writes me that you would like to hear about our 'squirrels.' On Sept. 17 squirrel No. 1 came down the chimney and took possession of the lower part of the house,

and on the following day No. 2 raced through the second story rooms. The chimney was then covered with netting and as there seemed to be two youngsters left in the chimney, the poor mother sat and cried on the outside of the wire. It was either the 22nd or 23rd that one of those in the chimney was coaxed out, but the other was never heard from and probably died in the chimney although we have tried every way possible to find the body.

"On Thursday, Oct. 6, I noticed small white crawling things under a rug—then, lifting the corners of other rugs, found thousands. Under fifteen oriental rugs we swept up several dustpans full, but none from under the Wilton carpet rug in the living-room, which of course made us think that they had something to do with the rugs. Our rugs we have had for several years, and they were all cleaned with vacuum cleaner about the middle of September.

"On my return from Boston, Friday, Oct. 14, the day I gave the specimens of maggot (or whatever it was) to Mrs. ———, I found that the family had been killing green flies all day by hundreds. They swarmed on the windows and were swept down and killed. They died hard—had to be burned or brushed into Dalmatian powder. It was exciting! This lasted for over a week. We gave up everything to kill flies. At first they were sluggish but later in the season they were harder to kill.

"My mother thinks that there is some connection between dead squirrel and fly—but why did they choose oriental rugs and not those of American manufacture? There were more found in the hall than in the rooms. The fireplaces from the squirrels' chimney are in the living-room and hall and there *were* more worms in those rooms. We are so anxious to know something about them—why we were so pestered, and if we have this to look forward to each October . . . I should have said that there are no birds or animals in the house and that the whole house was thoroughly cleaned just before the squirrels made their appearance—that was why we felt so disturbed."

[Jan. 4] "As to the rugs—on each floor is a large rug, and one in each doorway, leaving a space all around the rooms of about 1½ to 2 feet. All are oriental excepting the large one in the living-room. Most of the larvæ were found in the hall and recep-

tion-room, and in the front of the living-room. The rugs in the bay-windows were the most popular, excepting the large one in the hall, and it was at the front windows in the living and reception rooms that the flies swarmed.

"We are still finding three or four [flies] daily."

The flies, several of which were sent me, proved on examination by Mr. C. W. Johnson to be *Lucilia sericata* Meigen, a common green-bottle fly.

The accompanying plan and scale will make clear the relation of chimney, rugs, and windows, and the direction and length of the larval migration. The house faces nearly west.

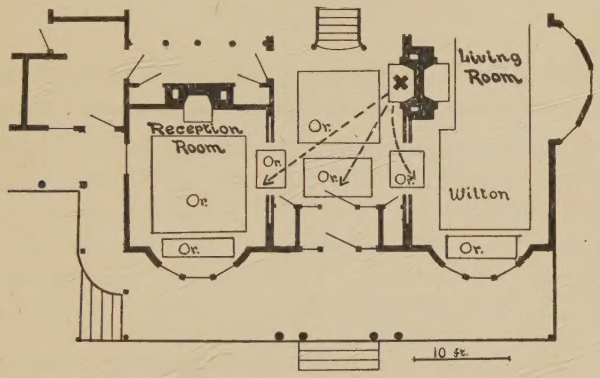

Fig. 1. X = fireplace of squirrel's chimney. The maggots were most numerous under the oriental rugs in the front of the hall and in the two bay windows at front of house.

Judging from the data secured, the odor of the decaying carcass of the squirrel, passing out of the top of the chimney, led to it the female flies seeking suitable places to oviposit. The larvæ of *Phormia regina*, an allied species, have been observed by Folsom to be negatively phototropic until maturity, when they become positively phototropic for a brief period, seek the light, leaving the food to travel to some distance; then, becoming negatively phototropic again, they seek shelter in which to pupate. Apparently, the larvæ of *Lucilia sericata* exhibit similar tropisms. This behavior, it is easy to see, is adaptive in character, resulting in the development and preservation of larger numbers, under natural conditions, than if the larvæ remained in the food material.

Although all of the larvæ that could be found were destroyed, it is evident from the abundance of the flies that many escaped

observation, perhaps remaining in the chimney, or being overlooked in the registers, etc.

The preference of the maggots for the oriental rugs rather than the Wilton was probably due to the softer texture of the lower side of the former, and the greater rigidity and weight of the latter. Possibly additional reason may be found in the character of the dyes used, which are said to be very largely of vegetable origin in the oriental rugs. To determine if this was also a factor experimentation would be necessary.

It is needless to say that assurance was given that there was little likelihood of a repetition of the disagreeable occurrence.

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